The Glass Industry

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Ceramists Meet in St. Louis This Month

Plans Maturing for the Twenty-fourth Annual Convention of the American Ceramic Society

CONVENTION HEADQUARTERS AMERICAN CERAMIC SOCIETY, HOTEL STATLER, ST. LOUIS, MO.

On February 28th many of the prominent technical men of the ceramic industries—officers of the American Ceramic Society — accompanied by several hundred of the rank and file of the membership, will descend on the Hotel Statler, St. Louis, Missouri, and from then until, and including March 3rd, various phases of ceramics —scientific, technical, industrial and social — will occupy the center of the stage. The occasion will be the twenty-fourth annual convention of the Society, and if the success of last year's meeting at Columbus and the interest already manifested in the coming gathering be indicative of what is to happen this year, the 1922 meeting will be the best ever held.

The widened scope of the Society, with its seven divisions devoted to the different branches of ceramics, have made it necessary to arrange for three separate sessions of each division besides three general sessions. There will be virtually seven conventions in one, and programs have been arranged. "colloquims" and formal discussions planned, and visits to local industrial plants so scheduled that anyone interested in any department of the silicate industries will find something especially interesting awaiting his attention during every hour of the convention days.

Many interesting and instructive papers will be presented at the general sessions and divisional meetings. R. D. Landrum, chairman of the Committee on Program, announced early in January that subjects for ninety-nine papers were already in hand as well as more than forty subjects for colloquia and discussions. Some of the titles in which the glass trade will be especially interested are:

PHYSICAL DEFECTS IN TANK BLOCKS, by G. A. Loomis, of the Corning Glass Works, Corning, N. Y.

THE TESTING OF SILICA BRICK, by K. Endell, Charlottenburg, Germany. Lantern.

DISSOCIATION OF FERRIC OXIDE DISSOLVED IN GLASS AND ITS RELATION TO IRON-BEARING GLASSES, by J. C. Hostetter and H. S. Roberts.

GLASS CONTAINERS, by A. W. Bitting, Glass Container Association.

OPERATION OF LEHRS, by C. E. Frazier, Simplex Engineering Company.

DISCUSSION OF ABOVE, L. H. Adams.

THE HANDLING, STORING AND SETTING OF GLASS POTS, by Wm. M. Clark and J. H. Forsythe.

REPORT ON TENTATIVE STANDARDS FOR ZINC AND GLASS HOUSE REFRACTORIES, by A. Silverman, Department of Chemistry, University of Pittsburgh, Pa.

SILICA BRICK MANUFACTURE, by R. M. Howe, Mellon Institute, Pittsburgh, Pa.

THERMAL CONDUCTIVITY, by R M. Howe, Mellon Institute, Pittsburgh, Pa.

COMMERCIAL VALUE OF RESEARCH, by G. W. Greenwood.

INFLUENCE OF FURNACE GAS PRESSURE UPON HEAT PENETRATION, RADIATION AND ALLIED PROPERTIES, by S. M. Phelps.

ELIMINATION OF WASTE IN CERAMIC INDUSTRIES, by W. A. Durgin.

REDUCTION OF VARIETIES IN MANUFACTURED PRODUCTS, by E. W. McCullough.

HEAT CONDUCTIVE DATA ON SOME COMMERCIAL REFRACTORIES, by A. S. Watts.

TENTATIVE PAPERS

POT ARCHES, by C. E. Frazier, Simplex Engineering Company.

HEATING UP OF POTS, by C. E. Fulton, Pittsburgh Plate Glass Company.

OPERATION OF A GLASS HOUSE FURNACE, by L. P. Forman, American Window Glass Company.

THE ACTION OF VARIOUS GLASSES ON POTS, by J. W. Wright, Macbeth-Evans Glass Co.

USE OF PRODUCER GAS IN GLASS MELTING TANKS, by Carl D. Smith, Hazel-Atlas Glass Company.

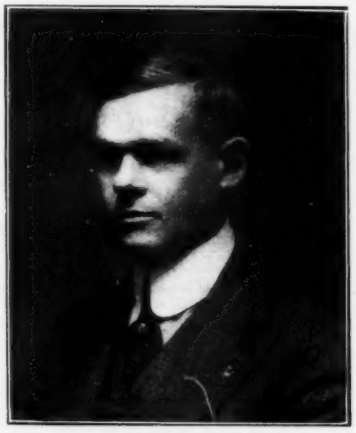
SILICA REFRACTORIES, by C. L. Norton, Massachusetts Institute of Technology, Cambridge, Mass.

E. W. Tillotson, assistant director of the Mellon Institute, Pittsburgh, Pa., represents the Glass Division and F. A.

Some of the Officers of American Ceramic Society, 1921-1922

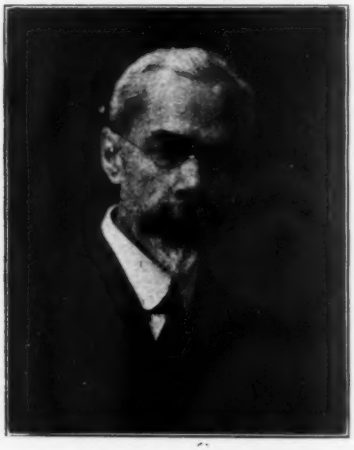
PRESIDENT, F. K. PENCE

TREASURER, R. K. HURSH
RE-NOMINATED FOR 1922-1923

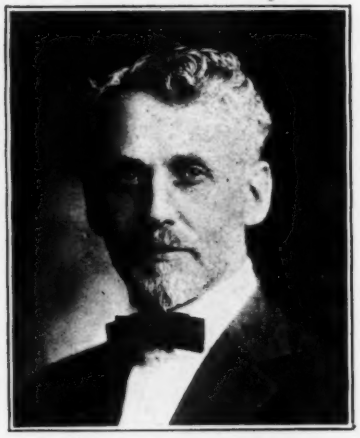


TRUSTEE, R. H. MINTON

TRUSTEE, R. M. HOWE



RECORDING SECRETARY,
CHAS. F. BINNS



GENERAL SECRETARY,
ROSS C. PURDY

Nominations for Officers of American Ceramic Society, 1922-1923

PRESIDENT, F. H. RIDDLE

VICE-PRESIDENT, E. WARD TILLOTSON
SECRETARY, GLASS DIVISION
1921-1922

TRUSTEE, B. E. SALISBURY

Harvey, U. S. Refractories Corporation, Mt. Union, Pa., represents the Refractories Division on the Committee on Program.

OFFICERS SERVING THE SOCIETY DURING 1921-1922

Besides the general officers for the year 1921-1922 whose portraits are presented herewith, others of whom photographs were not available for use in this issue are F. B. Ortman, Tropico Potteries, Glendale, Cal., vice-president; M. F. Beecher, Norton Company, Worcester, Mass., trustee, and R. T. Stull, United States Bureau of Mines, Columbus, O., trustee. Also Glass Division officers: J. C. Hostetter, Steuben Glass Works, Corning, N. Y., vice-chairman, and E. C. Sullivan, Corning Glass Works, Corning, N. Y., councillor.

Some of the Officers of the Glass Division

H. L. DIXON, COUNCILLOR

CHAIRMAN, W. M. CLARK

CHARLES O. GRAFTON, COUNCILLOR

NOMINATIONS FOR OFFICES FOR 1922-1923

The election of officers for 1922-1923 will be held during the convention. The nominating committee has reported the following nominations:

President, F. H. Riddle, Champion Porcelain Company, Detroit, Mich.

Vice-president, E. W. Tillotson, Mellon Institute, Pittsburgh, Pa.

Treasurer, R. K. Hursh, University of Illinois, Urbana, Ill.

Trustee, B. E. Salisbury, Onondaga Pottery, Syracuse, N. Y.

PLANT VISITATION AND OTHER ACTIVITIES

During the last two days of the convention visitors will be escorted to various local industrial plants where manufacturing processes of interest to ceramists will be observed. A series of motion pictures including one entitled "The Romance of Glass" will be shown in a theatre obtained for the occasion. To conserve time for the technical program and plant visitations, the business sessions will be as short as possible. One evening will be given up to purely social activities, including a meeting reminiscent of the old-time "Section Q" gatherings, to be followed by a dance—which recalls the fact that the ladies are cordially invited to attend all functions of the convention as well as the special entertainment which the local committee will provide for them. On Tuesday night, February 28, the annual banquet will take place at Hotel Statler, which will be convention headquarters and where all sessions will be held.

American Ceramic Society, 1921 - 1922

C. H. KERR, COUNCILLOR

Manufacturers of, and dealers in ceramic supplies and equipment are invited to display their products at the Statler.

LOCAL COMMITTEES IN CHARGE AT ST. LOUIS

General Chairman—J. L. Green, 1673 Railway Exchange Building.

Railroad Transportation—A. H. Killinger. Securing reduced fare certificates for return trips

Hotel Accommodations—E. M. McLean and W. J. Knothe. Location of Hotels other than Headquarters, rates, placing of delegates who arrive without accommodations reserved.

Publicity—E. C. Little. Notices in daily papers, meeting reporters, etc.

Service—A. W. Buckingham, Geo. H. Ducombe and L. C. Hewitt. Equipment of meeting rooms, lanterns and operators. Information, etc.

Smoker—Geo. D. Parker, F. H. Schwetye, A. D. Christopher and Carl B. Hahn. Program of entertainment, refreshments, smokes, etc. Monday Evening.

Banquet—C. W. Berry. Menu, speakers, music, flowers, smokes, etc. Tuesday Evening.

Entertainment of Ladies—Mrs. C. W. Berry. Planning events for entertainment of ladies who accompany members.

Trips—F. G. Jaeger, Chairman. Arrangements for alternative trips to plants, means of transportation, etc. Thursday and Friday morning and afternoon.

Refractories—H. W. Perry, Chas. Laird.

Glass—Geo. Aurian, Wilbur R. Smith, Max Atwood.

Enamels—H. W. C. Mehling, L. D. Bridge, Emil J. Luepke.

Terra Cotta and Enameled Brick—Paul C. Herold, J. H. Ivery.

Art—Geo. T. Ernst, Walter D. Thomas.

Heavy Clay Wares—P. S. Trowbridge, E. L. Blackmer, W. R. Morgan.

Reception—Fred S. Bell, Chairman; Geo. E. Thomas, A. A. Schmittgens, A. Malinovsky, Edwin A. Eigenbrot, R. S. Sherwin. Introducing members, "mixing" at social events.

Finance and Membership—R. D. Hatton, Chairman, P. S. Trowbridge, R. F. Grady, Lemon Parker, A. A. Van Cleve, Wm. Knoesel, W. W. Ittner, E. L. Blackmer, C. D. Gregg.

Arrangements—C. W. Berry, F. G. Jaeger, A. H. Killinger, E. M. McLean, A. W. Buckingham, Geo. W. Parker, Mrs. C. W. Berry, Fred S. Bell, R. D. Hatton, Geo. Ernst (representing the Art Division to arrange for art exhibit).

The Presidential Nominee

F. H. Riddle, the nominating committee's choice for president of the American Ceramic Society for 1922-1923, has served with great success during the past two years as chairman of the committee on membership. He was also for two years a member of the board of trustees.

The election of Mr. Riddle to the presidency is assured as the time limit for the filing of opposing nominations is now past. Mr. Riddle is a man of many years' experience in ceramics. From 1902 to 1904 he was employed in an art pottery; from 1904 to 1907 he was at Ohio State University; from 1907 to 1909 he was again connected with an art pottery, then spent seven years manufacturing sewer pipe and fire brick. During the years 1916 to 1919 inclusive, he was assistant to A. V. Bleininger in the Bureau of Standards and since 1919 has been with the Champion Porcelain Company, Detroit, Michigan. His experience includes the designing, building and operating of factories, which is an assurance that the Society will have a thoroughly practical man guiding its course through the coming year.

The City of St. Louis

Since the days of the early explorers St. Louis has been the scene of many important historical events. Its present population is about three-quarters of a million. The city is situated on the Mississippi River and four great bridges now span the stream at this point. Many important railroads center here. St. Louis is a great commercial and industrial center, transacting an enormous business in certain lines. Two universities, Washington and St. Louis, are located here. The city's Art Museum and Public Library rank high among the important institutions of their kind. The city is widely known as a musical center.

Among the industrial institutions holding particular interest for glass men are Laclede-Christy Clay Products Company, whose immense plant covers scores of acres devoted in large part to the making of glass-house refractories and firebrick; Walsh Fire Clay Products Company, Russell Engineering Company, glass-house engineers and constructors; Wiederholdt Construction Company, builders of glass factory chimneys; Williams Patent Crusher & Pulverizer Company. The Monsanto Chemical Works, producers of salt cake; Highlands Fire Clay Company, Grand View Fire Clay Mines and Tavern Rock Sand Company all have offices in the city.

The following glass factories also are located in St. Louis: Adolphus Busch Glass Manufacturing Company, manufacturers of bottles, August A. Busch, president; Oscar P. Doerr, manager. Obear-Nester Glass Company, prescription and beverage bottles, Jos. Nester, president, Jos. J. Nester, vice-president; D. W. Bagby, secretary; Samuel H. Wyss, treasurer. Schram Glass Manufacturing Company with offices at 1112-1116 Federal Reserve Bank Building, St. Louis, and factory at Hillsboro, Ill., D. Sommers, president and secretary; C. B. Sommers, 1st vice-president; A. L. Schram, 2nd vice-president and manager of factory, and X. G. Buehler, secretary. Mississippi Glass Company, manufacturers of rough and ribbed figured and wire glass, Julius S. Walsh, president; C. J. Gundlach, vice-president and general manager; R. D. Humphreys, vice-president and treasurer; A. J. Baldwin, secretary. Oriel Glass Company, manufacturers of bent glass, Franciscus L. Maguire, president; Charles J. Maguire, vice-president, and J. F. Maguire, secretary.

The American Ceramic Society—What It Is and What It Does

The American Ceramic Society is a technical and scientific organization to advance the ceramic arts and sciences by meetings for the reading and discussion of papers, the publication of scientific literature, and other activities.

It was founded in 1899 and now has a total membership of nearly 1,500, including active, associate, corporation, industrial, and honorary members.

The society publishes a monthly journal and is about to begin the publication of a bi-weekly bulletin that will bring to each member a digest of research activities and results, with special emphasis on industrial applications.

The society is organized into seven groups or divisions, as follows: Art, F. H. Rhead, chairman; Mabel C. Farren, secretary; Enamels, E. P. Poste, chairman, R. R. Danielson, secretary; Glass, W. M. Clark, chairman, E. W. Tillotson, secretary; Heavy Clay Products, R. C. Purdy, chairman, C. Forrest Tefft, secretary; Refractories, A. F. Greaves-Walker, chairman, F. A. Harvey, secretary; Terra Cotta, A. F. Hottinger, chairman, R. L. Clare, secretary; White Ware, E. T. Montgomery, chairman, C. C. Treischell, secretary. Local sections have been organized at various centers and these sections meet frequently.

One of the principal objects of the Society is to develop co-operative research. Twenty years ago ceramic concerns did not co-operate in research, most of them considering that they had valuable manufacturing secrets. But observation has shown that many "secrets" are duplicated in competitors' plants, often with improvements. No one advocates a policy of making known all original methods, processes, and machinery, that give marginal advantage over competitors. Most of these can be amply protected by basic patents. Concerns progress most rapidly when they practice an open policy regarding these things and cooperate with one another in research through such organizations as the American Ceramic Society.

The Melting of Glass*

A Continuation of the Report of the Discussion Which Took Place at the Meeting of the Society of Glass Technology on November 16, 1921, at Leeds University

"What is the effect on selenium decoloriser of having saltcake present in the batch?" This question was opened out by Prof. Turner, who promised, in the first place, that the point should be made one of research in the early future. He might venture, however, to indicate his slight experience in the matter. He knew that in batches in which selenium was used as a decoloriser saltcake was usually absent; at the same time he knew of some cases where the necessary amount of saltcake to avoid scumming was present. That amount might perhaps be 1 per cent, or at most 2 per cent, on the basis of the sand. Such an amount might be added without causing any serious effect upon the decolorising action of the selenium. From small-scale experiments it had been ascertained that in the case of melts where, on the one hand, only soda ash was used, and, on the other hand, where a little saltcake was used to the extent of anything from 1 to 5 per cent on the basis of the sand—it might be something like a fifth or so of the total alkali—the decolorising effect of the selenium was certainly very much diminished. He did not know that any experiments had been carried out on the possible reducing action of the selenium on sodium sulphate. Carbon, of course, naturally acted as a reducing agent upon sodium sulphate, and theoretically sulphur might perform a similar function if the sulphur was not volatilized before action was possible. Sulphur, with a higher melting point and not quite so volatile, might possibly be a little more active in that connection. The question was one which, he thought, might form the basis of a very interesting piece of work. Sometime—if no one else had decided the matter before—Sheffield University might find it possible to give some time to it with a view to determining the point. Whilst making these observations he must add something which, he thought, disagreed with his own views. It was better that they should have disagreement in discussions of this character, for it was by disagreement that debatable points would be the more clearly elucidated. Mr. R. L. Frink had been kind enough to send to him a note bearing upon the point. In this connection Mr. Frink said: "I consider that a small amount of saltcake is very efficient in stabilizing the color of the glass when selenium is used, this being particularly true for furnaces operating under strongly reducing conditions. We have found that 1 to 2 per cent of saltcake—20 lbs. to a thousand lbs. of sand—greatly improves the color and assists in eliminating the black edge which is usually found associated with soda-lime glasses that have an excess of soda. It also prevents the formation of scum. We know already the volume of saltcake, but just how it acts we are not quite certain." Prof. Turner went on to say that there was no doubt an advantage in adding saltcake to a glass, because it acted as a convenient scavenger, absorbing the labels, corks, and so on, that were sometimes introduced into the batch along with the cullet. But this was a point that might be considered quite apart from the question of its action upon the decoloriser. He was of the opinion that the latter question was one that might still remain a subject for research.

A member observed that it was an acknowledged fact that a selenium glass which was subjected to excessive heat in the lehr came out with a decided tinge of pink. He could not explain what was the precise chemical action which gave rise to this, but he could state the phenomenon as a fact.

Prof. Turner: Is it excessive selenium which gives you the pink color or excessive annealing?

Mr. E. A. Coad-Pryor said he would like to ask Mr. Frink if he would amplify his statement that the sulphates stabilized the color when selenium was used. The phenomenon relating to the change in color during the annealing of a selenium glass was one that was subject to most minute changes. He had seen bottles piled up, and in the pile every other bottle would be pink or green. He had noticed on a small scale that when more saltcake was present there must also be more selenium. He thought it would be comparatively easy to work out a scale determining the amount of the decoloriser to be used with varying amounts of saltcake.

Dr. Travers said he thought that the question of the change which took place in the lehr during the annealing of a selenium glass was very important, because it had been demonstrated that while it was possible to make a lovely colored glass as it came from the tank, the color was often lost in the passage of the glass through the lehr.

The next problem tackled was raised in the following question: "We are often troubled with dark specks in our actinic green glass. We use chromium oxide. What can we do to get this color, and avoid the dark specks?" Three bottles were produced demonstrating the fault in question.

In opening out the discussion on this point, a member suggested that the black specks were due to undissolved chromate compounds. Practically all the actinic glasses that were made employed chromium as the coloring oxide. In connection with tank furnaces the chromium was usually added as a chromate salt, in which case there was the quickest possible subdivision of the chromium. For pot furnaces the chromium was used in the form of bichromate or chromium oxide. There was a difference in the working of the two latter. The bichromate was very much more fusible, and in this case there was not so much liability to encounter infusible black specks. Seeing that the bichromate dissolved more readily in the glass, it was easier to incorporate along with the glass than the chromium oxide, but in any case where the temperature was not high enough, or where the mixture was not fine enough, the black specks would be encountered, although not quite to the same extent as with the chromium oxide. The specks were met with both in the batch and the cullet. If the specks were present in the cullet and this specky cullet were used, it would be impossible to avoid the specks in the ultimate glass. Was it possible that the inquirer was referring to black specks obtained in experi-

*The Pottery Gazette and Glass Trade Review.

mental work or to specky glass encountered in the glasshouse?

The questioner replied that he regretted to say that the bottles produced were taken from the glasshouse.

A further suggestion was made that in this event the fault appeared to be almost entirely due to the lack of temperature in the furnace or to insufficient fineness in the materials. During the recent coal strike, when one had to fire with what one might describe as "fuel by courtesy," it was almost impossible to get the requisite heat within the furnace, and this was a fact that had a particularly bad effect upon the actinic green glasses that were being made at that time. The trouble was, however, overcome by taking water-green chromium oxide, grinding it to pass a 150's sieve, and mixing that ground chromium oxide along with the sand in the ratio of 4 or 5 lbs. of the chromium to 30-40 lbs. of clean dry sand. In this case, even with a comparatively low furnace temperature, an absolutely clear green glass was obtained.

Another member suggested that in the making of actinic green glass in covered pots a method that was much preferable was to utilize a portion of bichromate and a portion of the oxide, for, if bichromate were used by itself an unsatisfactory color might result. A mixture of the two was more calculated to have a better covering power within a reasonable time without the risk of black specks in the glass.

"Have you ever tried boiling the bichromate?" asked another member.

Prof. Turner said he had been approached many times with regard to this question of actinic green glass, and he was anxious to get the opinions of members with regard to it. It had been suggested in the discussion that the fault was largely a question of thorough admixture. It was well known that chromium oxide had a somewhat limited solubility in glass, and he remembered that Mr. J. H. Davidson had made some experiments bearing upon the solubility of chromium oxide in ordinary lime-soda glass, but he (Prof. Turner) had forgotten just what conclusion was reached. Probably the chromium oxide that remained in a glass in large specks for some time got into such a state that it would not go into solution. It was a common experience that on heating the oxides of alumina and chromium, if violent ignition occurred, they became insoluble, particularly in the case of strong oxides. Had anyone any experience of the solubility of chromium oxide in boric oxide or borax, and, seeing that boric oxide was a well-known solvent for metallic oxides, might not this assist as another means of avoiding the speckiness complained of?

"BOILS" IN GLASS

A lively discussion on the above subject was initiated by Mr. Milton Asquith. It was raised by the presentation of a question formulated as follows: "We have sometimes noticed that metal in the tank has appeared to be quite plain, yet after a few hours further a "boil" has developed. Can anyone say why this should be caused and what we can do to prevent it?"

Mr. J. H. Davidson said the phenomenon was very common, both in pot and in tank furnaces.

Mr. V. H. Stott suggested that the explanation lay in the fact that there was a temperature at which the solubility of gases was at a maximum.

Mr. J. Adamson observed that he had seen a tank quite plain at the filling-on end, but at the working end there was a "raw boil." He was of the opinion that the cause was a chill to the furnace, especially to particular parts of the furnace.

Prof. J. W. Cobb suggested that the phenomenon was related to the existence of oxides which could exist in several states of oxidation. He suggested that at some stage reduction occurred with the evolution of carbon, and then this carbon burned out and gave rise to gas. This reduction could be shown by observation.

Mr. E. A. Coad-Pryor pointed out that they had to distinguish between several types of boil.

Mr. F. W. Adams referred to the case of a bottle he had seen which was plain on one side and boily on the other.

Dr. Travers observed that little was known about the supersaturation of gaseous solution. Even when glass was plain it contained gases in supersaturated solution. Accurate observation of conditions was needed.

Prof. Turner referred to three types of boil; one type was due to the dropping into the glass tank of the end of the gathering iron. He had known of cases where attempts were deliberately made to spoil the glass in a tank and so to stop its working. A railway sleeper was thrown into one tank! In a second type, if there was in solution in a glass any trace of water, a boil might be due to the slow liberation of hydrogen. This, however, depended upon whether any water actually remained in the glass. Thirdly, if the metal was stiff, and the temperature was raised, a boil might develop. After referring to carbon and sulphur batches for amber metal, the professor instanced a case where graphite was added to a tank. Suddenly the metal boiled and even frothed over, while some of the graphite came to the surface and burnt in a shower of sparks. One possible cause of boils was the reduction of hydrocarbon in the gas, with deposition of carbon. Again, if the batch used contained too much moisture, or if the cullet was wet, the resulting glass might contain a good deal of boil or fine seeds, which it was almost impossible to eliminate. It was also possible that when saltcake was used some of it might remain dissolved in the glass. The amount probably varied according to the temperature and the time in the furnace. Just as a carbon amber glass might set up boils under oxidizing conditions, so the decomposition of small amounts of saltcake might take place.

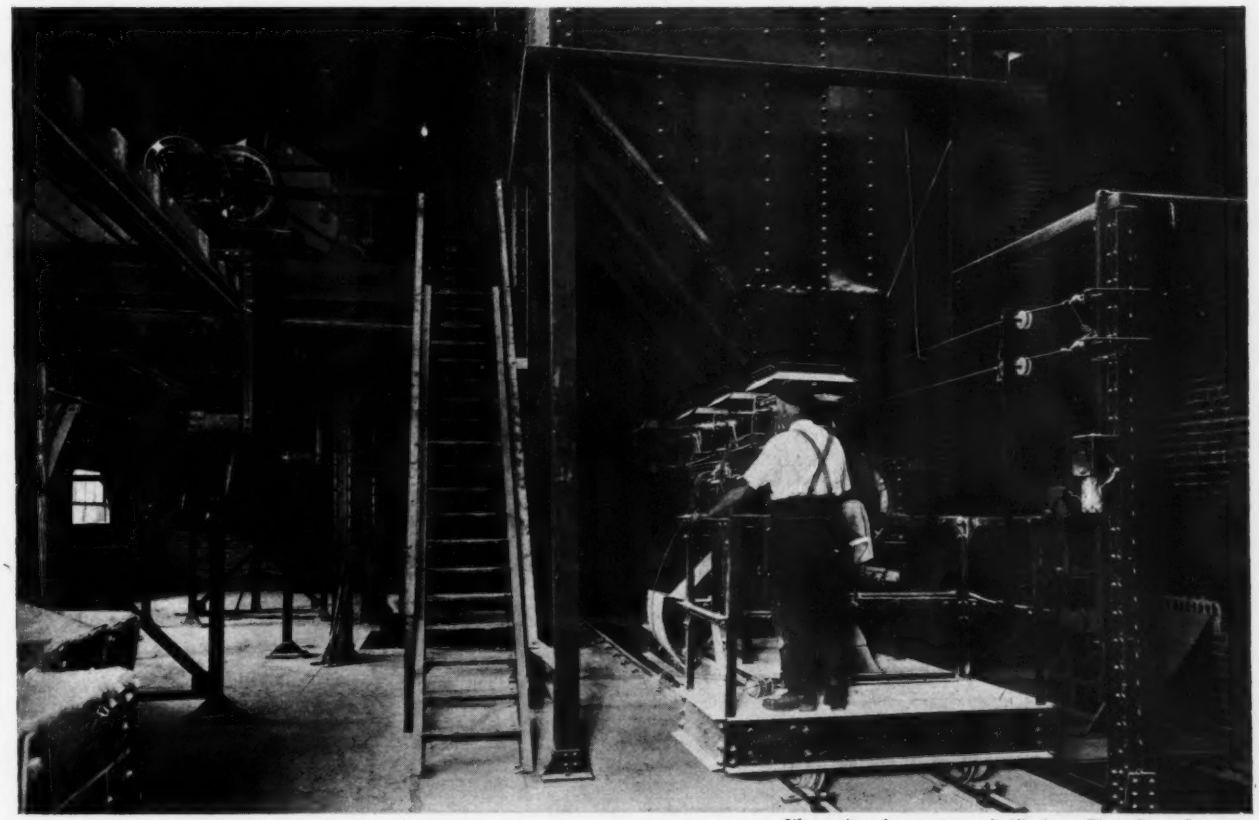
Viscosity and Annealing Discussed at December Meeting

At the December meeting of the Society of Glass Technology, held in University College, London, a paper by Mr. F. Twyman entitled: "The Annealing of Glassware and Annealing Without Pyrometers," was presented. This paper, which was illustrated by lantern slides, experiments and demonstrations, gave an account of some work done since the reading of a paper on "Annealing" before the society in February, 1917. It was based on the assumption that, so far as the practical annealing of glassware was concerned, the problem was simply one of the release of strain in a highly viscous liquid. There were two difficulties involved in determining the annealing temperature of a glass from its viscosity. The first was fundamental, e. g., if E is the modulus of elasticity, and T the time of relaxation, then the viscosity is $E \times T$. But the time of re-

laxation cannot be determined from the viscosity unless, at the same time, the modulus of elasticity be known, and data are not available for the modulus of elasticity of glasses at temperatures within the annealing range. At the same time glasses do not enormously vary their moduli of elasticity as the temperature is raised, and a very big change of modulus of elasticity would be necessary to cause any important difference of annealing temperature. The second objection was of a practical nature. In determinations of annealing temperatures which are obtained by means of measurement of viscosity, one requires to measure the temperature at which the viscosity of the given glass has an observed value. This requires a pyrometer, and a small, easily controllable furnace. The author went on to describe a method which he proposed, which removed both these objections. It was based on Maxwell's expression for the removal of strain in viscous solids. A piece of the glass required to be annealed (which piece might be of any shape and size so long as it was possible to deform it elastically by a comfortably perceptible amount) was introduced into the furnace among the articles to be annealed. It was elastically strained by a definite amount, sufficient stress being brought to bear to deform it to that extent, and in this way it was brought to an artificially unannealed state. Periodically the stress was removed, and it was allowed to spring back if it would to its original shape. As the temperature of furnace was raised, a time would come when the test piece did not spring back entirely, and from a record of the time during which the piece had been kept strained at a particular temperature and the extent to which it recovered its original position, it would be possible, if desired, to calculate the time of relaxation at the temperature. But for practical purposes that was not necessary, for if it sprang back on release by one-half its originally strained amount, one knew that it had been half annealed; if to one-tenth, it was 90 per cent annealed, and so on. This time was quite independent of whether the lehr had been kept at a constant temperature during the annealing or not. And if the test piece deliberately strained was thus annealed, then the other objects which had passed through the same temperature and were originally strained by want of annealing, would become annealed simultaneously to the same degree.—*The Pottery Gazette and Glass Trade Review.*

Modern Methods of Making Plate Glass Illustrated

A Series of Interior Views of a Successful Factory



Illustrations by courtesy of Allegheny Plate Glass Company

1. Handling the Raw Materials.—Scrupulous supervision, supplemented by all the precaution that mechanical ingenuity can offer, characterizes the selection and handling of the raw materials, and their preparation for the furnace. Typical of this vigilance, the ingredients pass over magnetized pulleys before entering the bins, removing any stray nails or metal which may have accidentally entered. Regular analyses by qualified chemists serve as a further check.

Proportions by weight are mechanically measured at the bins' outlets, insuring absolute uniformity. Then the operator runs the car a short distance and dumps the contents on a conveyor which feeds the mixer shown at the upper level, left. There the batch is mixed and discharged by gravity into traveling cars suspended beneath. These run to the furnace room and are met by the charging crane. The crane conveys the loaded car to the furnace and an electrically controlled arm or dipper, entering the furnace through a small opening in the tuile, deposits the mixed batch ingredients in the empty pot awaiting them.

Producer Gas Plant Design

By R. F. CLEWELL*

(Written for THE GLASS INDUSTRY*)*

(Concluded from the January number)

THE GAS DISTRIBUTING SYSTEM

The system of gas mains for distributing the gas from the producer plant to the furnaces in which it is to be used as fuel, constitutes one of the most important parts of the producer gas system. The arrangement of this system of distribution should receive careful study by the designer as the success of the installation as a whole depends largely upon the ability of the gas mains to handle satisfactorily the output of the producers.

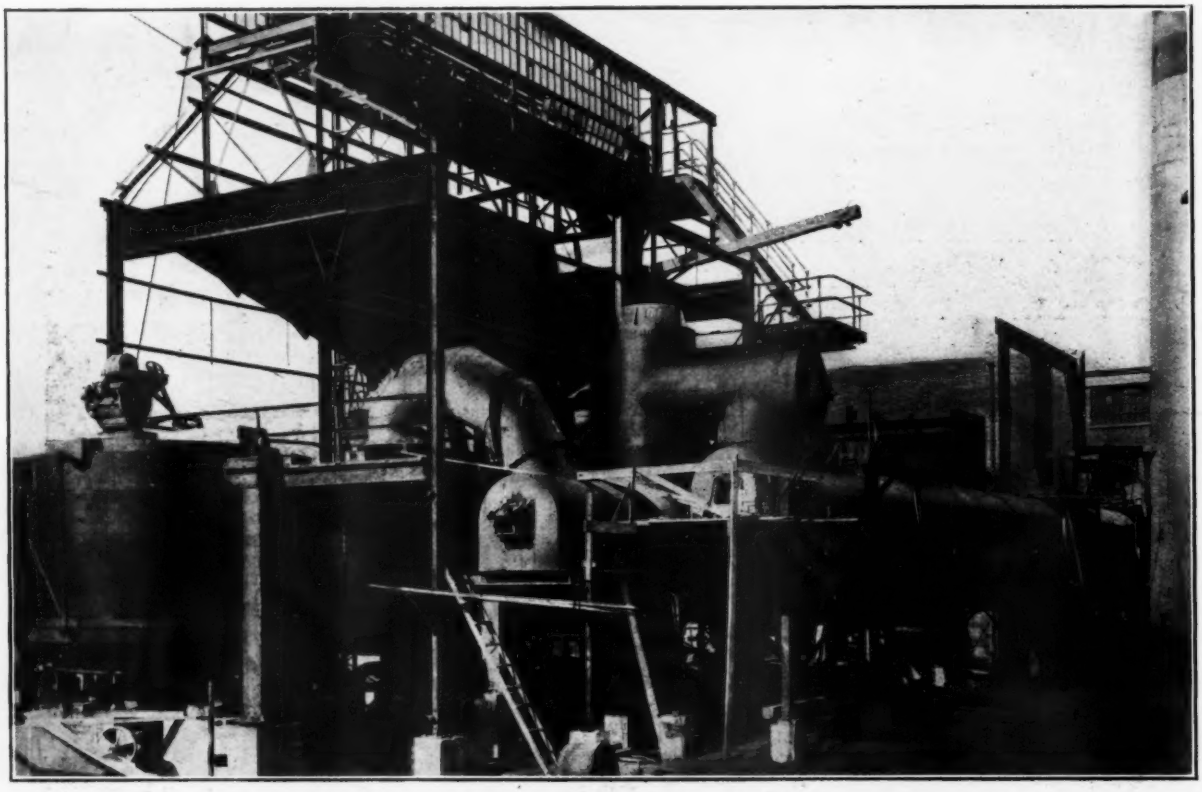


FIG. 8. SHOWING A GAS MAIN CONSISTING OF A SERIES OF HOPPERS. THIS IS A VERY GOOD DESIGN FOR COLLECTING AND PROVIDING FOR THE QUICK REMOVAL OF DUST

In every producer gas installation the condition causing the most difficulty and annoyance is the accumulation of great quantities of coke dust and soot in the gas mains. It is necessary at intervals, generally once a week, to give the mains a thorough cleaning in order to remove this accumulation, otherwise in a comparatively short time they would become completely closed.

Up to the present time no satisfactory means has been devised for quickly and completely removing the dust carried in hot producer gas as it comes from the producer and the only provision made for collecting this suspended matter is to proportion the mains as to size so that during the passage of gas from producer to furnace these relatively heavy particles of dust may settle out by gravity and accumulate in the bottom of the main where they are allowed to remain until such time as the amount thus collected begins to restrict the free gas passage sufficiently to interfere with the operation of the plant. It then becomes necessary to shut the plant down, open doors located in the side or top of the gas main and by one method or another remove the deposit. In hand-poked producer installations this cleaning process can be accomplished by opening up the main, the production of gas being stopped, and by making a connection directly to the stack, the natural draft of which draws into the main a large quantity of air which, upon coming in contact with the hot soot causes its rapid combustion. This is a simple process and can generally be accomplished in from one to three hours, depending of course on the length and size of the main and the number of stacks acting upon it. The cleaning process required on mains carrying gas from an installation of mechanical producers is, however, not so simple or easily performed for the reason that the quantity of dust is greater and the dust itself is not as free burning as the light flaky soot from hand-poked producers.

In making provision for handling the dust thrown out by a mechanical producer it is important to catch and hold a large portion of the coke dust near the point where the gas leaves the producer and the best means for accomplishing this is to cause a very sudden drop in gas velocity as near the off-take of the producer as possible. The effect of this is to cause the gas, which has much less inertia than the comparatively heavy dust, to be practically stopped while the dust continues in its path, which should preferably be down, and is collected in a suitable hopper or receptacle. In order to produce this sudden decrease in gas velocity the gas should be allowed to discharge into a proportionally large area very soon after leaving the producer. As an example we will consider a mechanical producer gasifying 30 tons of coal per day. This rate of gasification will produce 178 cubic feet of average quality of producer gas per second at a temperature of 1500° F. We will assume the internal area of the brick lined off-take to be 8.3 square feet. This volume of gas passing through this area will travel at a velocity of 22 feet per second. Now if we assume the off-take to be connected to a chamber of any description whatever having a sectional area of 50 square feet, the velocity of the gas stream as it enters this enlarged area will be reduced from 22 feet per second to 3.5 feet per second. This sudden slowing up of the stream of gas will have the effect of causing it to float sluggishly through this chamber at a very low velocity and in consequence the heavier particles of dust will immediately settle out by gravity and collect in the bottom of the chamber. The shape or construction of this large chamber into which the gas discharges is of very little importance as regards its ability to remove dust from the gas. The only important point being to have an area at right angles to the flow of the gas through it, sufficiently great to cause a very low gas velocity. A satisfactory and simple means of bringing about a rapid settling out of the heavy dust near the producer is to construct the gas header, into which all producers will discharge, of such size as to greatly decrease the velocity of the gas stream, upon entering it. Practically speaking it is impossible to remove from the gas more than a small percentage of the total volume of entrained dust at any one point in the gas distributing system by means available at the present time. We therefore find that a more or less heavy settlement of dust occurs all along the line up to a distance of three or four hundred feet from the producers. The point at which this settlement stops and the gas becomes practically clean depends to a large degree upon the velocity of flow in the main. Where the system of gas lines from producers to furnaces is short, say, for parallel runs, less than one hundred and fifty feet, it will be found that the deposit of dust will extend the entire length. It is therefore well in designing a short run of gas main to provide an area sufficient to keep the velocity low, say, not over ten feet per second, in order that as much dust as possible will settle out and not be carried over into the furnaces where it may cause trouble by clogging up flues and regenerators.

If the gas mains are purposely designed so that a major portion of the dust carried along in the gas will settle out in them and not be carried over into the furnace then it will be necessary to provide adequate means for removing it in the shortest possible time, and the simplest and quickest way of doing this is to let it drop out through openings, provided with fairly gas tight gates located in the bottom of the main, provided it is above ground, which is incidentally the only way that a producer gas main should, under any circumstances, be constructed in connection with mechanical producers. If the method of removing the dust from the lines is to be that just mentioned then the openings in the bottom must be continuous and fairly close together, say on four foot centers, otherwise they will be of very little use and the cleaning of the main will have to be effected by stirring up the dust by means of a steam jet, allowing the draft of the furnace stacks to pick it up bodily and carry it out where it will spread over the countryside. Hoppers

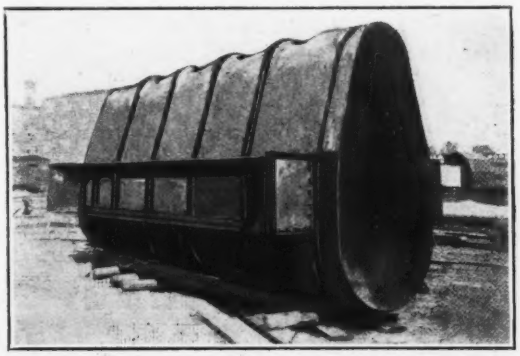


FIG. 9. A SHOP VIEW OF A SECTION OF A CONTINUOUS HOPPER-BOTTOM GAS MAIN. IT IS SHOWN UPSIDE DOWN

attached to the underside of a gas main at widely separated intervals of say fifteen or twenty feet for the purpose of collecting dust are useless as regards any benefit they provide and the expense of attaching them might just as well be saved. If they are used as supports for the main they are all right for this purpose although a structural steel support would probably be cheaper.

A main constructed as shown in Fig. 8 consisting of a series of hoppers is a very good design for collecting and providing for the quick removal of dust. A continuous run of this type of main designed with a free area of pipe above the hoppers sufficient to insure a gas velocity of ten or fifteen feet per second would greatly simplify the matter of removing dust from the mains, as by opening the gate in the bottom of each hopper the entire accumulation of soot may be dropped out. Fig. No. 5 (see page 7, January, 1922, issue) shows another design of main in which the hopper at the bottom of the section is continuous. This design is even better than the one just described as when the main is cleaned the entire area is open for gas passage whereas with the saw tooth arrangement the available gas passage whether the hoppers are full or empty is only that portion above the hoppers. Area for area, the main with the continuous hopper bottom is the less expensive of the two designs, and by equipping the bottom with a gate consisting of bell and seat, which is a device sufficiently gas tight to allow of dumping the dust from the main while the plant is in operation, it would be possible at all times to keep a main, constructed with this continuous hopper bottom, clean and of maximum clear area. Fig. 9 is a shop view of a section of continuous hopper bottom gas

main and is shown upside down. The narrow tapering portion is the bottom and the openings at which points gates are to be attached are clearly shown.

Even though it is very undesirable to arrange a producer gas plant in such a way as to necessitate the construction of long runs of gas mains, it sometimes happens that due to local conditions it becomes necessary to conduct gas four, five or six hundred feet, or even more, to a battery of furnaces. When such an arrangement is required, it is important to know beforehand what the loss in gas pressure between producers and furnaces will amount to. The average top pressure under which a mechanical producer operates ranges from ¾ inch to 2 inches of water column, which is, in reality, a very slight pressure but sufficient. With this pressure at the producers and amply large gas lines of a length not over one hundred and fifty or two hundreed feet, and free from a large number of leads and structural obstructions, the loss in pressure throughout the system is negligibly slight. When, however, it is necessary to carry the gas a greater distance, say five or six hundred feet, more careful attention to the matter of design is necessary. In the first place, a gas line of this length is very expensive and it is necessary to keep the size at a minimum. This will require accurate predetermination, for guess-work will either result in a woeful waste of material or in a still more woeful condition of unsatisfactory operation. It is further necessary to insure in advance that the size of the line be such, that with the normal pressure of producers of say not to exceed 2 inches of water column, the gas pressure at the furnaces will be sufficient for operating requirements.

The total loss of pressure, due to the flow of gas through the main, which is the difference between the gas pressure at the furnace valve and the pressure at the producers, is made up of the loss due to friction of the gas stream against the walls of the main, the loss due to resistance such as elbows, bends, restrictions and enlargements of the section and pressure difference due to elevation.

The first two of these losses are functions of the velocity of the gas stream and the third is a change in static head or pressure which may be either a loss or gain, depending whether the gas is forced to a lower level or rises to a higher level. This change in static head, due to elevation, amounts to ± .01 inches of water column per foot of change in elevation.

Time and space are not available to take up in detail here the method of calculating the total probable pressure loss which will occur in a gas main under whatever conditions it may operate. The calculations for determining this probable loss in pressure are not difficult, however, and although the results are theoretical to a certain extent, the coefficients of frictional and resistance losses have been obtained under practical conditions similar to those existing in a clean, brick-lined gas main, and to this extent are accurate and reliable. When using results obtained from calculations of the probable pressure loss in a producer gas main, it must be remembered that the main is never really clean, and that from day to day between periods of cleaning, the actual conditions depart further and further from the calculated conditions, and for this reason when proportioning the size of the main, such calculations, indicating what may be expected in the way of pressure loss, while of great assistance, must be used with the knowledge that they indicate only the best or ideal condition, and that a certain allowance must be made for the conditions which obtain in actual operation.

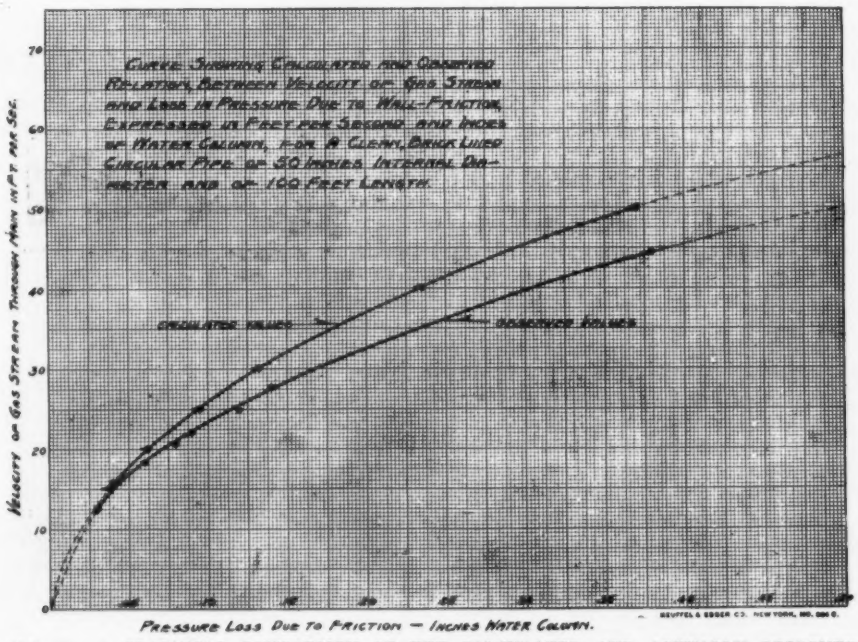

CURVE SHOWING CALCULATED AND OBSERVED RELATION BETWEEN VELOCITY OF GAS STREAM AND LOSS IN PRESSURE DUE TO WALL FRICTION, EXPRESSED IN FEET PER SECOND AND INCHES OF WATER COLUMN, FOR A CLEAN, BRICK LINED CIRCULAR PIPE OF 30 INCHES INTERNAL DIAMETER AND OF 100 FEET LENGTH.
CALCULATED VALUES
OBSERVED VALUES
VELOCITY OF GAS STREAM THROUGH MAIN IN FT. PER SEC.
PRESSURE LOSS DUE TO FRICTION — INCHES WATER COLUMN.

FIG. 10. A GRAPHICAL COMPARISON OF THE CALCULATED AND ACTUALLY OBSERVED PRESSURE LOSS DUE TO FRICTION AT VARYING VELOCITIES IN A STRAIGHT LENGTH OF CIRCULAR BRICK-LINED GAS MAIN

Fig. 10 is a graphical comparison of the calculated and actually observed pressure loss due to friction at varying velocities in a straight length of circular brick-lined gas main, having a clear area of 13.7 square feet and length of one hundred feet, and carrying producer gas at a temperature of approximately 1,200° F.

The values plotted on these two curves are as follows:

Velocity of gas stream in ft. per sec.	Observed pressure loss in inches of water	Calculated pressure loss in inches of water
12.5	.03	.024
18.4	.06	.052
20.6	.08	.065
22.1	.09	.075
25.0	.12	.095
27.7	.14	.116
44.5	.38	.290

It will be noted from this comparison of observed and calculated values that the calculated pressure losses are consistently slightly lower than the actual losses, and this is to be expected since the calculated values are based on a perfectly clean main and, as stated previously, this is never attained under actual conditions.

A fairly accurate method, a "rule of thumb" method of determining the size of mains is to proportion them so that a certain predetermined low velocity will not be exceeded.

RATE OF FLOW OF GAS IN CUBIC FEET PER SECOND AT VARYING TEMPERATURES

Tons of coal gasified per 24 hrs.	60° F.	700° F.	800° F.	900° F.	1,000° F.	1,100° F.	1,200° F.	1,300° F.	1,400° F.	1,500° F.
5	7.5	17.70	19.20	20.71	22.28	23.79	25.27	26.28	28.37	29.85
10	15.0	35.40	38.40	41.40	44.60	47.60	50.50	54.50	56.70	59.70
20	30.0	70.80	76.80	82.80	89.20	95.20	101.00	107.10	113.50	119.50
30	45.0	106.20	115.20	124.20	133.70	142.70	151.70	160.80	170.10	178.00
40	60.0	141.60	153.60	165.70	178.30	190.40	202.00	214.10	226.40	238.6
50	75.0	177.00	192.00	207.20	222.80	238.00	252.50	268.00	283.60	295,5
60	90.0	212.20	231.00	248.50	267.20	285.30	303.00	321.60	340.10	358.10
70	105.0	248.00	269.00	290.00	312.00	333.00	354.00	375.00	397.00	418.00
80	120.0	293.00	307.20	331.00	356.50	380.40	404.50	428.50	458.00	477.50
90	135.0	318.70	346.00	372.50	401.0	428.00	455.00	482.00	510.20	537.50
100	150.0	354.00	384.00	414.00	445.8	476.00	505.50	535.00	567.00	597.50
150	225.0	531.00	576.00	621.50	668.0	713.50	758.50	803.00	851.00	895.00

In calculating the velocity of the gas stream in the main, it is necessary, since the volume of a gas varies directly as the absolute temperature and indirectly as the absolute pressure (the pressure variation for producer gas is practically zero and may be ignored), to take into account the temperature of the gas at the point where the velocity is calculated. In a main of given length and uniform cross-sectional area carrying a given weight of gas per second which enters the main at an initial high temperature and after passing through its length, leaves at a lower temperature, the velocity of flow of the gas stream will be constantly changing and will leave the main at a considerably lower velocity than that at which it entered. This, of course, is due to the fact that a given weight of gas will occupy a greater volume at say 1,500° F. than at 1,200° F.

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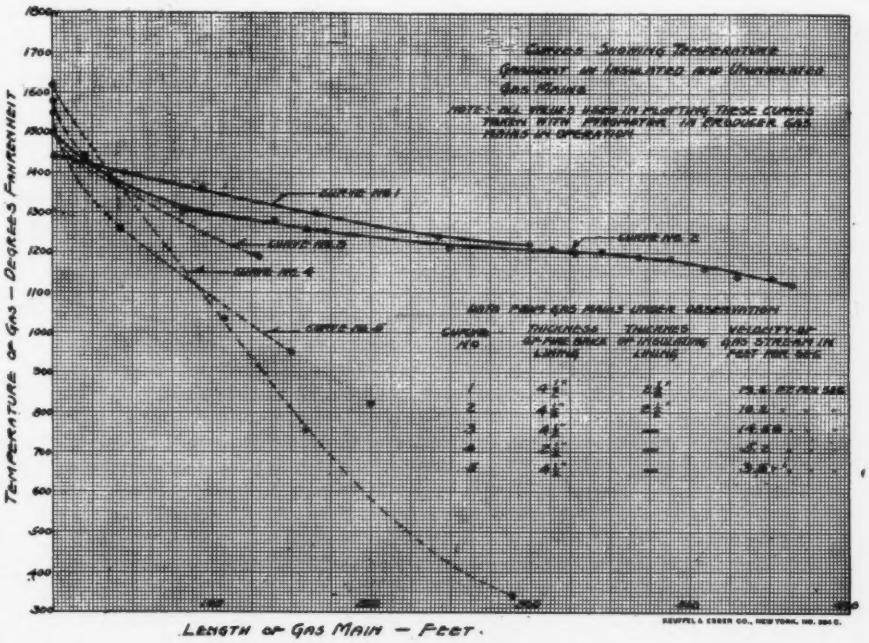

FIG. 11. CURVES SHOW THE TEMPERATURE DROP OF PRODUCER GAS FLOWING AT THE VELOCITIES INDICATED, IN INSULATED AND UNINSULATED MAINS

In addition to the necessity of providing in the design, means of handling the large volume of dust which accumulates in producer gas mains and of correctly proportioning the entire gas distributing system as regards areas and allowable pressure losses, there is a third factor in the design of the system which under some conditions is quite important. This is in relation to the insulation of the gas main for the purpose of decreasing the loss of the sensible heat of the gas.

There are two important reasons why a gas main should be insulated.

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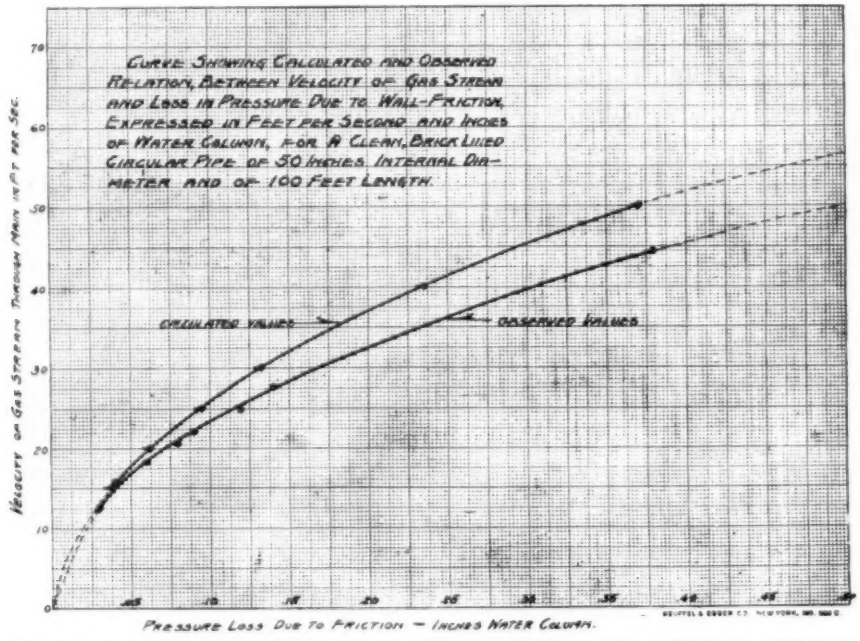
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30	45.0	106.20	115.20	124.20	133.70	142.70	151.70	160.80	170.10	178.00
40	60.0	141.60	153.60	165.70	178.30	190.40	202.00	214.10	226.40	238.6
50	75.0	177.00	192.00	207.20	222.80	238.00	252.50	268.00	283.60	295.5
60	90.0	212.20	231.00	248.50	267.20	285.30	303.00	321.60	340.10	358.10
70	105.0	248.00	269.00	290.00	312.00	333.00	354.00	375.00	397.00	418.00
80	120.0	293.00	307.20	331.00	356.50	380.40	404.50	428.50	458.00	477.50
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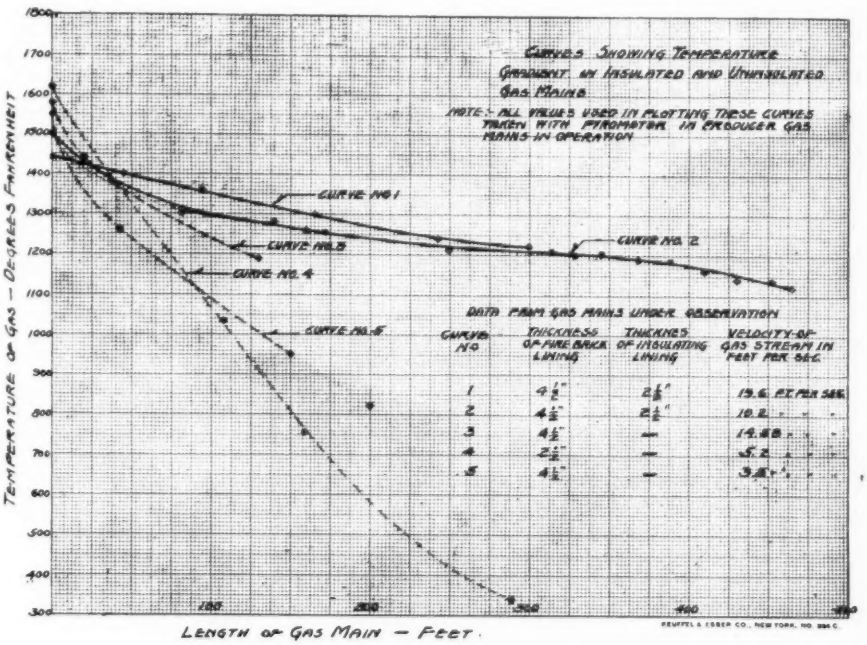
CURVES SHOWING TEMPERATURE GRADIENT IN INSULATED AND UNINSULATED GAS MAINS
NOTE:- ALL VALUES USED IN PLOTTING THESE CURVES TAKEN WITH PYROMETER IN PRODUCER GAS MAINS IN OPERATION
CURVE NO 1
CURVE NO 2
CURVE NO 3
CURVE NO 4
CURVE NO 5
DATA FROM GAS MAINS UNDER OBSERVATION
CURVE NO
THICKNESS OF FIRE BRICK LINING
THICKNESS OF INSULATING LINING
VELOCITY OF GAS STREAM IN FEET PER SEC.
TEMPERATURE OF GAS - DEGREES FAHRENHEIT
LENGTH OF GAS MAIN - FEET.

FIG. 11. CURVES SHOW THE TEMPERATURE DROP OF PRODUCER GAS FLOWING AT THE VELOCITIES INDICATED, IN INSULATED AND UNINSULATED MAINS

In addition to the necessity of providing in the design, means of handling the large volume of dust which accumulates in producer gas mains and of correctly proportioning the entire gas distributing system as regards areas and allowable pressure losses, there is a third factor in the design of the system which under some conditions is quite important. This is in relation to the insulation of the gas main for the purpose of decreasing the loss of the sensible heat of the gas.

There are two important reasons why a gas main should be insulated.

First, because at the temperature which the gas leaves the producer, 1,400° to 1,600° F., the amount of heat radiated through the fire brick-lined walls of the main during its passage to the furnace is very great and by reducing this radiation, by placing a lining of insulating brick between the outside shell of the main and the usual fire brick lining, a large portion of the sensible heat, which would otherwise be lost, is retained and passes to the furnace. (The question of whether this retention of sensible heat is of value in a regenerative furnace or not, is not for discussion here.) The saving of sensible heat is equivalent to many tons of coal saved per year, how many depends on the size of the installation, also the size and length of the gas main. In an installation gasifying approximately seventy-five tons of coal per day (24 hours), the gas is carried a distance of five hun-

dred feet to a battery of furnaces. The gas main is insulated which saves, by decreasing radiation through the walls of the main, an amount of heat in a year's time equivalent to 1,270 tons of coal. This amount of heat is saved as far as the producer gas system is concerned; if it is lost in the regenerative furnace that is a matter relating to furnace design or waste heat recovery.

The second reason why insulation is important for producer gas mains is that the tar vapor, which is a by-product of producer gas, condenses and is precipitated as a heavy black tar when the gas becomes chilled. This precipitation commences when the temperature of the gas reaches 800° or 900° F. and increases as the temperature of the gas drops. If the gas is allowed to cool below 900° F. two undesirable conditions result. First, the condensation of the tar vapor in the mains results in a direct loss in heat value of the gas as the vapor has a high heat value, and secondly, the heavy tar which is thrown down fouls the furnace reversing valves and causes serious trouble in the nature of shutdowns.

In deciding when insulation is necessary or desirable and when it is not, it is essential to take into consideration for what purpose it is installed. As regards reduction of radiation and consequent conservation of heat, it is evident that this result is obtained even in very short mains, although the saving effected is proportionately less than in long mains. As regards low temperature gas and consequent condensation of tar vapor, insulation is not necessary to insure temperatures sufficiently high to prevent this trouble in mains of less than one hundred and fifty feet, so that for comparatively short mains the advantage of insulation consists of reducing the radiation losses of the main. It is a personal opinion that for mains properly designed and under one hundred and fifty feet long, insulation is not warranted, unless the gas is to be used in direct fire as in lehrs, ovens or kilns. On the other hand, all mains over one hundred and fifty or two hundred feet should be insulated.

The curves shown in Figs. 10 and 11 are plotted to show the temperature drop of producer gas flowing at the velocities indicated, in insulated and uninsulated mains. In all cases the mains are lined with fire brick and when insulation is used it is placed between the outside shell and the fire brick lining. From these curves it will be possible to determine with some accuracy what may be expected regarding temperature drop in producer gas mains under conditions similar to those under which the observed values used in plotting the curves were obtained.

In discussing the broad subject of producer gas plant design in the foregoing, it has been the aim of the writer to merely touch on the most important factors entering into such a design, and the treatment of the subject is intended to be in the nature of a presentation of a few practical suggestions, which, it is hoped, may be of some service to those interested in the construction of producer gas installations.

The Laboratory

By J. B. KRAK

The Qualitative Analysis of Glass

Until comparatively recent times only six oxides entered into the composition of glass, namely, the oxides of the elements, silicon, aluminum, calcium, lead, sodium and potassium. The developments of industries in which glass is used caused demands to be made on glass makers, which were met by the creation of entirely new types of glass for the chemical industry, the manufacturer of optical goods and for modern methods of illumination. The success in working out these problems is in a large measure due to the efforts of Otto Schott,[1] the founder of the Jena Glass Works. Schott made innumerable experiments with practically all known elements with the object of studying their effects on the properties of glass in which they were introduced. He was the first to prove definitely that the chemical and physical properties of glass depend on its chemical composition, both in a qualitative and quantitative way, and laid the foundation for all subsequent developments in the chemistry of glass making.

In the majority of cases a qualitative analysis of glass is unnecessary. In routine control work, the composition of the glass is known and the analyst can at once proceed to a quantitative examination. Even when a glass of unknown composition becomes a subject of study it is usually possible to ascertain through a few simple tests whether the sample is a soda-lime glass, a lead glass or one of more complicated composition. The complete analysis of some of the modern types of glass is quite difficult and requires a thorough knowledge of inorganic analysis. The directions given below are intended to furnish information and suggestions and are by no means exhaustive. Rarely, if ever, will a glass contain all the elements for which tests are mentioned and the analyst will in nearly all cases be able to shorten the procedure materially.

Preparation of the Sample

For careful work it is necessary to break up and pulverize the sample in an agate mortar. Any other material would, through abrasion, contaminate the sample. Where the iron contents of the sample is immaterial, it may be broken up and pulverized in a mortar of hard steel, but care must be taken to remove all particles of metal by means of a strong magnet. The sample should be ground fine enough to pass through a 60 mesh sieve, but finer grinding is not necessary. In many cases grinding to a 40 mesh size is entirely sufficient.

Qualitative Analysis

A lead glass may be recognized by holding a piece about the size of a pea in a small flame of a Bunsen burner for about two minutes. If, on cooling, the glass shows a black color, lead is present. Finely ground glass, on addition of

[1] E. Zschimmer, Die Glasindustrie in Jena.

a few drops of ammonium sulphide, will turn black if the sample contains lead.

Transfer a sample weighing about two grams to a platinum crucible, add a few drops of water and about 20 cc. of hydrofluoric acid. Stir with a platinum rod, evaporate to dryness on a steam bath, add a few drops of sulphuric acid and repeat the treatment with hydrofluoric acid. Evaporate again to dryness, heat until all sulphuric acid is driven off, add a few drops of hydrochloric acid, some hot water, and heat for a few minutes. If a white, insoluble residue remains it may be silver chloride, lead sulphate, barium sulphate or a mixture of these substances. If the residue has a violet color it may contain gold; if reddish it is probable that selenium is present. The insoluble residue is tested as follows: Add strong ammonia and heat. Filter and acidify the filtrate with nitric acid. A white precipitate shows the presence of silver.

Boil the ammonia-insoluble residue with a concentrated solution of ammonium acetate, filter and acidify the filtrate with acetic acid. Add a few drops of potassium dichromate and heat to boiling. A yellow precipitate which after a short time changes to an orange color, indicates lead.

The final residue is boiled with a concentrated solution of soda, which changes any barium sulphate present to barium carbonate. The latter is filtered off, washed with water and digested with hot hydrochloric acid. Filter and to the filtrate add a few drops of sodium sulphate solution. A white precipitate indicates barium.

If a reddish color makes the presence of selenium a probability, evaporate the residue with concentrated hydrochloric acid, add water and filter. Gas the filtrate with sulphur dioxide. A red precipitate indicates selenium.

If a violet color indicates the presence of gold, heat the residue with aqua regia, dilute, filter and to the filtrate add a few drops of a mixture of stannous chloride and chlorine water. If a purple precipitate is formed (purple of Cassius), gold is present.

The solution obtained after treatment with hydrofluoric, sulphuric and hydrochloric acids is tested according to the usual procedures of qualitative inorganic analysis.

1. HYDROCHLORIC ACID GROUP.—Silver and lead are in the insoluble residue and need not be regarded here.

2. HYDROGEN SULPHIDE GROUP.—To a few cubic centimeters of the sample add hydrogen sulphide water. A yellowish, reddish, or brownish precipitate indicates arsenic, antimony or tin, respectively. Small quantities of arsenic and antimony are found in many glasses. Larger amounts of arsenic occur in opaque glasses containing lead. Tin is frequently found in enamels. If any of these three elements are present in large amounts they will also be found in the residue after treatment with hydrofluoric acid.

A yellow precipitate may indicate cadmium; a black precipitate shows the presence of lead which has not been removed completely by the first treatment with mixed acids. If the preliminary test shows the presence of any elements belonging to the second group, the solution is gassed with hydrogen sulphide for about one hour, while the temperature is kept at 60° C. The precipitate is filtered off and tested as usual.

3. AMMONIUM SULPHIDE GROUP.—The following elements may occur in this group: iron, manganese, cobalt, nickel, zinc, aluminum and chromium. If the glass is opaque it may contain phosphate and in that case calcium phosphate is precipitated. The elements are recognized by the usual tests.

4. AMMONIUM CARBONATE GROUP.—Barium has been found and separated previously. Strontium occurs only in exceptional cases. Therefore calcium is the only element found in this group. Magnesium is found in the filtrate from the fourth group. If present it forms a precipitate on addition of a few drops of a solution of microcosmic salt.

The simplest way to test for alkalies, including lithium, which is found only rarely, is to make a fusion with ammonium chloride and lime according to the procedure of J. Lawrence Smith.

Boron is found in many glasses which are resistant against chemicals and in optical glass. This element may be recognized by the green color which it imparts to a flame when a sample is heated with hydrofluoric and sulphuric acids. If barium and copper are present this test is not conclusive, as these elements also color a flame green. In this case the sample is boiled with soda solution, filtered and the filtrate tested as described.

Fluorine, which often occurs in opaque glasses, is found by treating a sample with concentrated sulphuric acid in a platinum crucible covered with a piece of window glass. If the surface of the glass is etched fluorine is present. The test can be made more sensitive by covering the glass with a thin layer of wax and removing a small strip in the center. During the test the glass should be kept cool.

In order to test for sulphate and chloride it is necessary to make the original solution of the sample with hydrofluoric and nitric acids. The radicles are tested for with barium chloride and silver nitrate, respectively.

Yellow or brown glasses may contain sulphide which is partly driven off as hydrogen sulphide and partly converted to sulphate by the acid treatment. It is tested for with a strip of lead acetate paper.

Analytical Weights

A few months ago in investigating three imported sets of analytical weights, it was found that the weights from 0.5 to 0.05 of a gram were made of a decidedly magnetic material. During the past month a similar set, several years old, was likewise found to have magnetic weights which caused great irregularities when an attempt to calibrate them was made. Weights of this character can be readily detected by using a small magnet, and it is well for purchasers of analytical weights to be on their guard against them, as under some circumstances serious errors may be introduced by using such weights.—*U. S. Bureau of Standards Notes.*

Research Chemicals Listed

A list of chemicals not ordinarily available for research and other work has been issued by the National Research Council, Washington, D. C., and copies will be mailed to those applying for it.

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ADVERTISING RATES ON APPLICATION

NEW YORK, FEBRUARY, 1922

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CLASSIFIED BUYERS' GUIDE PAGE 10

Government Publications

The following advance pages of MINERAL RESOURCES OF THE UNITED STATES, 1920, have been published by the United States Geological Survey.

Arsenic, Bismuth, Selenium and Tellurium in 1920. By Victor C. Heikes, 19 pages.

Fluorspar and Cryolite in 1920. By Hubert W. Davis, 16 pages.

Sodium Compounds in 1920. By Roger C. Wells, 12 pages.

Who Is Paying the Indemnity?

Since the signing of the armistice Germany has been springing a few surprises on the world, no less startling than some of the fruits of Kultur served during the war. Only it has required more time to fully appreciate them. Lately it has dawned on us that all the world has been paying the German indemnity. Even before defeat had become a certainty in Germany, a careful propaganda had been started in neutral countries to induce the public to buy paper marks and German municipal bonds. The bait was, of course, the well known superiority of everything German, the stability of their currency, the genius of their leaders; all of which would restore the mark in a few years to its pre-war value. The results of this get-rich-quick campaign have been most gratifying. If in doubt ask any barber, street car conductor, school teacher, or small land owner in Copenhagen, Amsterdam or Stockholm.

Soon after the war was over, in fact while the casualty lists were still filling the newspapers, a similar campaign was started in the United States and in spite of the enormous losses incurred by investors, the propaganda to induce outsiders to pay the reparations is going on unabated. Every time a payment has become due a veritable avalanche of paper money has descended on the world's financial markets, with the result that the mark is now quoted at about two for one cent. Yet these paper marks were exchanged for gold or its equivalent.

The French indemnity of 1871 was paid by floating a loan which was mainly subscribed for by the people of France. No internal loan has been attempted by Germany; neither have taxes been raised to the levels of France and Great Britain. Why burden the German people as long as the world is willing to exchange gold for wood pulp?

It is a well known fact that the fall of the mark in the markets of the world has been much faster than its loss of purchasing power within the Fatherland, with the result that the pay of German workers when expressed in American money is now about at the level of that of the Chinese coolie. Since 90 per cent of the cost of a manufactured article represents labor it is clear why Germany can and does undersell any other country in the world's markets. The allied and neutral countries are in the throes of a business depression caused in part by the reparation payments, while German industry and export trade is flourishing and unemployment is practically nil.

A well known editor of a metropolitan newspaper recently stated that "so long as the American wage stands greatly in excess of the foreign wage, just so long foreign markets will belong to foreign producers." It is submitted that this being the case we prefer to let foreign producers have their foreign markets if we can keep our own markets open to our own manufacturers. It is estimated that about $300,000,000 worth of foreign goods are being imported each month into the United States. The greater part of this sum represents wages paid to employ European labor.

As we view the matter the proposition comes down to this: The rest of the world needs the products of our agriculture, our mineral wealth and of American inventive genius. This country needs the rest of the world a great deal less than

they need America. We are therefore in a position to prohibit altogether the importation of certain goods and we can and must demand a protective tariff to a point where American industry can offer competition and at the same time continue to offer to its workers employment at a wage which enables them to live according to the accustomed standards of our land.

Technical Consultation Service

THE GLASS INDUSTRY invites its readers to refer to this department any problems with which they may be confronted pertaining to raw materials, glass technology, laboratory and factory practice. While making no pretensions to the possession of unbounded knowledge or infallibility THE GLASS INDUSTRY is ready to assist its readers to the best of its ability in solving their problems. Readers who can offer better suggestions are invited to submit them.

Answers to all questions will be made by mail as promptly as possible. The source of all inquiries will be held in strict confidence.

QUESTION 17. We receive numerous complaints from glass manufacturers asking for a remedy for devitrification. For the benefit of those manufacturers we would like to have you republish part of the article on Devitrification and Revitrification of Glass, by J. B. Krak that appeared in your issue of February, 1921.

ANSWER. We reprint below the part of the article referred to and will also be glad to have any glass manufacturers who experience trouble from devitrification or other causes make use of the Technical Consultation Service.

"Excessive silica, especially in glasses low in lime, may cause the formation of a peculiar form of devitrification known as scum. Silica has been identified in scum as tridymite and cristobalite. It appears that the silica has never been completely dissolved, due to lack of heat necessary to melt a high silica glass. An excess of lime or magnesia renders glass liable to crystallization. Pure calcium and magnesium silicate can be cooled to the vitreous state only rapidly, and glass saturated with these compounds is inclined to devitrify. Borax and alumina are used with success to overcome this condition. Glasses containing potash and lead seldom devitrify, and the addition of these substances to the batch may help to eliminate existing troubles. Due to these properties optical glass can be allowed to cool very slowly without crystallization. Soda lime glasses, under similar conditions, would become entirely opaque."

QUESTION 18—Assuming that silica and lime are bases other than alkalies in a batch of silica, lime, soda ash and a little salt cake in a tank furnace, are the alkalies continually being driven off the longer the glass remains in the furnace? In other words, does the glass that lies in dormant pockets contain less alkali than that in the fresh channels of glass in the working end of the furnace? Suppose glass in the melting end of the furnace has been subjected to a certain temperature, and through carelessness it is subjected to a higher temperature in the working end, is the resulting foam that of alkalies being driven off?

ANSWER—My experience with tank furnaces leads me to conclude that only very little alkali is driven off during the melting and fining processes provided the batch composition corresponds with the maximum temperature to which the glass is heated. There is a very definite relation between the amount of alkali which can be incorporated in glass and the temperature to which it can be heated without loss of alkali.

Suppose we have two batches, A and B, which are identical as regards sand and limestone but A contains more alkali than B. It follows then that glass A can be made at a lower temperature than glass B. Let us call the temperatures at which the glasses can be made *a* and *b* degrees. If glass A is heated to temperature *a* no loss of alkali will take place. If glass A is heated to a higher temperature there will be a loss of alkali. If glass A is heated to *b* degrees and kept at this temperature long enough, it will be found that enough alkali is driven off to render the resulting glass A and B identical in composition. During the time necessary to raise the temperature from *a* to *b*, a foam may be observed due to volatile alkali. There will be no further loss in alkali if the temperature remains at *b* degrees.

Glass which lies in pockets does not lose any more alkali than glass found in the channels, provided of course that the temperatures are the same in both places.

I wish to make it clearly understood that this relation between alkali contents and temperature is a personal opinion, based on practical experience and not a scientifically established fact.—J. B. K.

Correspondence

To the Editor of THE GLASS INDUSTRY:—

In the January issue of THE GLASS INDUSTRY, page 15, under the title *Architects and Glass Makers*, there appears the following: " . . . the glassmaker supplied materials of such excellence that their like has not been equalled since."

Permit me to take issue with that statement and to say that better, not as good, but *better* glass is produced today than was ever produced in ancient days. Modern chemistry has given us such comparatively pure reagents as the ancients never realized, and the natural result, other things being equal, is better glass.

Let us admit that there are certain effects in the windows of some of the continental cathedrals, impossible of reproduction, and what is the answer? These effects were produced not by the glassmaker, but by "Father Time" and are no part of the glass *per se*. Put some modern glass in position where the sun and atmosphere have full play upon it and in the course of a few years the same iridescent effects will be there.

And as for coloring, the modern glassmaker can produce more and better colors than the ancients ever dreamed about, due once again, to the strides made in producing purer and a wider range of raw materials. I may be told that there are no modern windows that can compare with the excellence of the old, and the reason is not far to seek, but it is not incapacity of the modern workman. Take church windows, for instance. Who controls and orders them? Generally, a committee of the church, consisting of a few local tradesmen whose idea of art is not very exalted. And in making their selections what is the ruling motive? Not art, but price. An artist wants, say, five hundred dollars for a window—an upstart will put it in for two hundred and fifty. Result: The artist is left to starve and we get a lot of shoddy work which is a positive eyesore.

But there are exceptions. Thirty years ago I, personally, made some glass for a church in the county of Norfolk, England, and when those windows were installed they created quite a furor. Architects traveled from all over the world to see them and I personally met on a transatlantic boat an architect from Vancouver, B. C., who assured me he had made the trip especially to see those windows.

When a piece of modern work can draw the *cognoscenti* from all corners of the earth to look at it, it seems there is no reason to deplore the "lost art." Give the glassmaker and the artist the opportunity and they will produce work as good or better than was ever produced by the ancients, but it will never be done while buying in the cheapest market controls our actions.

W. BLENKO.

Eureka Art Glass Company, Milton, W. Va.
January 27, 1922.

[It is indeed interesting to have an expert's opinion on the controversy whether ancient cathedral glass is better than the modern product, or the reverse. The writer of the editorial referred to in the letter printed above can claim no special knowledge on this subject and made the statement referred to on the authority of an architect who had made a study of old cathedrals, more especially those of Northern France.

The view that time is an important factor in obtaining the beautiful effects for which antique glass is noted, is certainly worthy of careful consideration and our correspondent's expression of opinion on this subject is gratefully received.—J. B. K.]

Recent Patents

NEW INVENTIONS DESIGNED TO IMPROVE GLASS AND THE MEANS OF PRODUCING IT

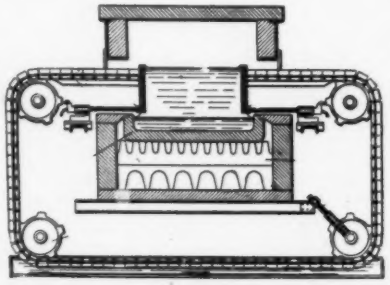
Copies of the Patent Specifications mentioned below may be obtained from the Commissioner of Patents, Washington, D. C. Price 10c. each.

Method of and Apparatus for Forming Glass Tubes. U. S. 1,395,963. November 1, 1921. Karl Küppers, of Aachen, Germany, assignor, by mesne assignments, to the Chemical Foundation, Inc.

This invention relates to a method of forming glass tubes in which a skeleton body such as a tube or the like shaped wire netting is embedded, the object being to provide glass tubes which are capable of resisting great pressure and are not liable to break.

In carrying out the invention a tube or the like shaped wire net is placed over a mandrel of the desired form, and a glass tube is slipped over this wire net. The tube is closed at one end and a vacuum pump is connected to the other end and after drawing out the air, this end of the tube is also closed. A ring or the like heated by electric current, gas or any other suitable means is then placed over the mandrel and glass tube and moved upward or downward so that the glass tube is heated from end to end. The external air then compresses the softened part of the tube against the wire netting or other skeleton body whereby the glass passes through the meshes of the skeleton body and conforms to the shape of the mandrel.

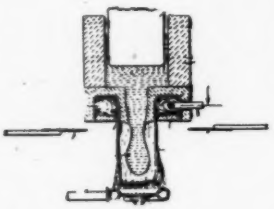
Sheet-Glass-Forming Apparatus. U. S. 1,397,326. November 15, 1921. Michael J. Owens, of Toledo, Ohio, assignor to the Libbey-Owens Sheet Glass Company, of Toledo, Ohio.



This invention relates to apparatus employed in the manufacture of sheet glass by the method which consists in drawing a sheet of glass upwardly from a pot of molten glass and bending the sheet to a horizontal direction in which it is advanced through an annealing oven. It is customary in such apparatus to employ a metal bending roll over which the sheet of glass runs to change its direction. This roll which must be run at the same surface speed as the glass passing thereover, always has a more or less injurious effect on the surface of the glass, which is at this time soft and plastic, so that the surface of the glass is dulled by the roll and also takes the impress of any roughness or irregularity in the surface of the roll.

An object of the present invention is to provide means to support the glass as it is drawn, without injuring the glaze. When the invention is embodied in apparatus for drawing the glass upwardly and then deflecting it to a horizontal direction, it provides bending means which will not mar the glass. For this purpose a bending device having a sliding movement along the surface of the glass is employed, the surface of the bending device in contact with the glass consisting of wood or an equivalent material which may be run in contact with glass while the latter is soft and plastic without marring or injuring the surface of the glass. Such material, however, would be quickly destroyed by the heat from the glass unless some special provision were made for keeping it cool. This invention overcomes this difficulty by providing means to maintain the bending device at the required low temperature.

Glass-Working. U. S. 1,401,922. Dec. 27, 1921. Karl E. Peiler. West Hartford, Conn. Assignor to Hartford-Fairmont Company.



This invention relates to a method of conserving the heat of molten glass flowing from a container and successively severed into charges, which consists in inclosing the vertical sides of the flowing glass below the plane of severance of the charges with an unconfined flame curtain out of contact with the glass.

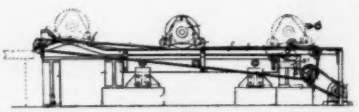
Machine for and Method of Making Corrugated Wire-Glass. U. S. 1,397,149. Nov. 15, 1921. Arno Shuman, of Philadelphia, Pennsylvania, assignor to Pennsylvania Wire Glass Company, of Philadelphia, Pennsylvania.

The principal object of the present invention is to provide for the manufacture of corrugated wire glass in which the wire is properly centered and which presents smooth and sightly surfaces.

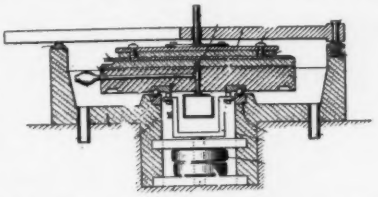
In accordance with the method of this invention a corrugated sheet of wire glass is made by rolling with a corrugated roll and a corrugated table, and the rolled corrugated sheet of wire glass while still hot is subjected to a pressing operation with a corrugated press upon the corrugated table whereby distribution of the glass in proper corrugations in respect to the corrugated wire is assured and attained, and whereby the corrugated surfaces of the glass are freed from gashes and marks which may have been made upon them, for example, in cases where the corrugated wire glass sheets have been additionally rolled with a flanged roller in order to preliminarily center the wire mesh or in cases where the surfaces have been otherwise marred or deformed.

Glass-Rolling Mechanism. U. S. 1,398,046. November 22, 1921. Jacob Soderberg, of Pittsburgh, Pennsylvania, assignor to Pittsburgh Plate Glass Company.

The invention relates to apparatus or machines for rolling glass, such as employed in the manufacture of plate glass and preparatory to supplying the sheets thus formed to the annealing lehr. The invention has for its primary objects the provision of an improved rolling apparatus, wherein provision is made for maintaining the roll employed at a uniform temperature during the periods between successive rolling operations and the provision of improved and simplified means for operating the roll employed. The invention also includes means for automatically elevating the roll and continuing its rotation when such roll reaches its position at the end of the table, the same driving mechanism being employed for moving the roll back and forth along the table and for rotating it when it reaches the end of the table. In the embodiment of the invention illustrated, the mechanism for lifting the roll comprises a tilting cradle provided with supporting rollers which the roll engages when it reaches its end position, such engaging causing the tilting of the cradle to carry the roll away from the table, at which time the rollers of the cradle permit the continued rotation of the roll.

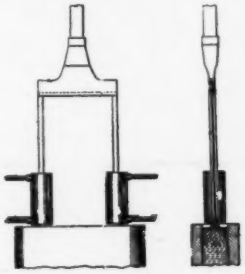


Method for Producing Flat Parallel-Sided Glass Sheets. U. S. 1,398,050, Nov. 22, 1921. William H. Taylor of Charleroi, Pennsylvania, assignor to Pittsburgh Plate Glass Company.



This invention relates to a method for producing flat parallel sided sheets of glass. These sheets are intended primarily for the production of the glass employed in sextant mirrors and such articles, but it will be understood that the glass produced may be used for other purposes requiring perfectly plane parallel surfaces. The glass employed in sextant mirrors must have absolutely plane parallel surfaces, and it is the particular purpose of this invention to provide a procedure and an apparatus whereby the surface of the glass can be produced with the greatest degree of accuracy and at a very low cost as compared with the methods heretofore employed. One embodiment of the apparatus for carrying out the process is illustrated in the accompanying drawing.

Sheet-Glass-Drawing Machine. U. S. 1,398,109. November 22, 1921. Orlan P. Marconet and William O. Carter, of Clarksburg, West Virginia. This invention relates to machines for manufacturing glass.



In machines of this character, the glass is usually brought from the furnace in the form of cylinders, which subsequently are subjected to a flattening process before they can be made into sheets. This not only requires considerable time, but also considerable labor, both of which elements can be dispensed with by use of the present invention.

The chief characteristic of this invention resides in the provision of means to preserve straightness and uniformity in width of the glass as it is drawn from the furnace thus producing a sheet of rectangular formation.

To this end, the invention makes use of a plurality of cooling devices arranged at opposite sides of the furnace and through which the longitudinal edges of the sheet of glass pass while being drawn from the furnace. The edges are cooled and hardened as the sheet is drawn outward from the furnace, the edges being also thickened so that the sheet glass lying between the edges is afforded straightness and uniformity in width.

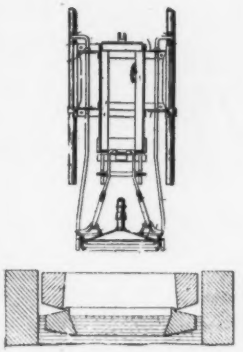
Mold-Clamp for Glass-Forming Machine. U. S. 1,398,670. November 29, 1921. Edward G. Bridges, of Anderson, Indiana, assignor to Lynch Glass Machinery Company, of Anderson, Indiana.

This invention relates to glass molding machines wherein the molds are mounted on a movable carrier and are successively brought into the several operating positions where they have to be held shut by suitable clamping devices.

The objects of the invention are to provide automatic means for securely clamping the molds shut in proper position during the successive operating periods, and to unclamp the molds and permit them to be moved along to their next operating position at the end of the operating periods.

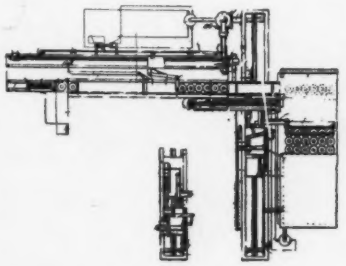
Further objects are to provide for accommodating molds of different heights and sizes to suit the different sizes of bottles or other articles being formed, and for adjusting the clamping jaws to center the molds accurately in operating position; and to dispose of the clamping jaws and operating devices in a compact unit not liable to derangement and easily accessible for adjustment.

Glass-Drawing Apparatus. U. S. 1,398,019. November 22, 1921. Halbert K. Hitchcock, of Pittsburgh, Pennsylvania, assignor to Pittsburgh Plate Glass Company.



The invention relates to a bait for use in drawing glass cylinders which are subsequently cut up into sheets for use in windows and for other purposes. The primary objects of the invention are the provision of an improved form of the so-called cold bait, (1) which can be used for drawing cylinders without the usual cap or neck, (2) which is automatic in operation, and (3) which can be conveniently and easily handled with a minimum amount of breakage in the cylinders drawn.

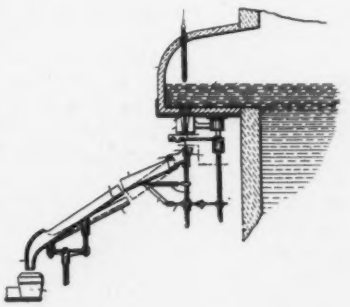
Bottle-Conveying Machine. U. S. 1,399,260. December 6, 1921. John Jimas, of Alton, Illinois.



This invention relates to bottle conveying machines and has for its object to provide a machine to automatically convey, or transfer newly formed bottles, released from a molding machine, to the lehr, or annealing lehr, thus obviating the necessity of help to carry the bottles from the molding machine to the lehr, as is now the common practice in bottle factories.

A further object of the invention is to provide a machine, so constructed that the newly formed bottles released from the molder will be first elevated and deposited upon one end of a platform, moved in groups to the opposite end of the platform and deposited upon an elevator by means of which they are lowered to the entrance of the lehr, automatically transferred from the elevator to the lehr and finally moved to a predetermined position in the lehr.

Means for Conveying Glass to Molds. U. S. 1,399,176. Dec. 6, 1921. James Whittemore, of Detroit, Michigan, assignor to the Owens Bottle Company, of Toledo, Ohio.



This invention relates to means for transferring molten glass from a furnace or gob forming apparatus to molds. An object of the invention is to provide improved means for transferring the charges of glass from a single flowing device or gob forming apparatus alternately to the molds of different glass forming machines, thereby permitting a number of machines to be fed from a single source.

In its preferred form the invention comprises inclined troughs or chutes with their upper ends superposed and the lower ends diverging laterally to discharge the glass into molds on different machines. The charges of glass are directed alternately to the two troughs by means of a hinged section or switch, the lower end of which moves up and down to register alternately with the stationary troughs.

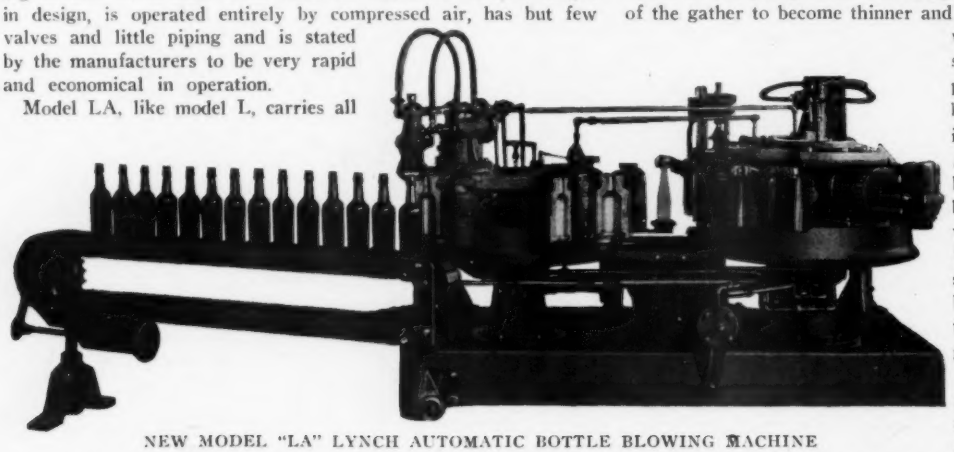
Glass Factory Equipment and Supplies

THE GLASS INDUSTRY will be glad to publish descriptions of new and useful devices, machinery and supplies of interest to the glass manufacturing trade. Most of the information printed in this department comes direct from the manufacturers of the products described.

New Model Lynch Bottle Blowing Machine

The new model "LA" of the Lynch automatic bottle blowing machine recently brought out by the Lynch Glass Machinery Company, Anderson, Ind., and illustrated below, differs in many respects from the Lynch "No-Boy" model L, a machine which was designed when semi-automatic machines fed by hand-gatherers were popular. The model LA is completely automatic when used in conjunction with any high-class mechanical feeding device. It is built lower than the old model LA, is simple in design, is operated entirely by compressed air, has but few valves and little piping and is stated by the manufacturers to be very rapid and economical in operation.

Model LA, like model L, carries all blank and blow molds overhanging from their carriers, an arrangement that, it is claimed, makes the machine capable of discharging every particle of glass or partly blown bottle that otherwise might remain in the molds.



NEW MODEL "LA" LYNCH AUTOMATIC BOTTLE BLOWING MACHINE

It is stated by the Lynch company that by reason of the molds being simply forms or shells set into arms on the machine, and no hinges, pins, links, lugs, clamps, keys or bottom plates being required, the cost of molds for this machine is quite low.

The mechanical means provided for transferring the blank or parison from the blank mold to the blow mold and for removing the finished bottle from the blow mold at the discharge point is such that the glass does not touch the open mold seams, a feature, it is claimed that greatly lengthens the useful life of the mold.

A full set of mold equipment for model LA consists of: six blow molds, six blank molds, six neck rings, one plunger, one baffle plate, and one funnel All mold equipment for model L may be worked on LA.

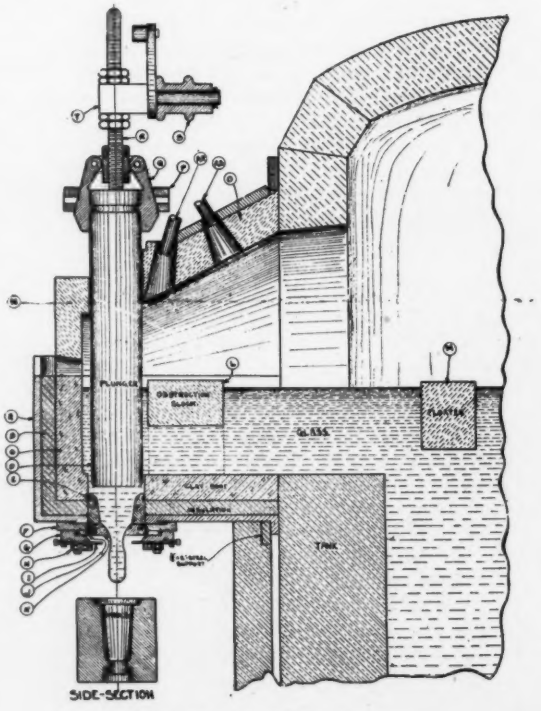
The range in capacity of model LA covers bottles in sizes from 4-ounces to 64-ounces capacity, and in heights from 4-inches to 13½-inches under the finish, and diameters up to 4⅝-inches. In the wide mouth line, jars with an outside diameter of opening up to 3 5/16-inches may be made. When operated with a mechanical feeder, model LA is rated as being capable of producing bottles at a speed of eight to twenty-five per minute, depending upon the size and style of the bottle. The machine may be operated by hand-gatherer, in which case special equipment is required.

Approximately 125-cu. ft. of free air per minute is required to drive the machine at maximum speed. Thirty-five to 40 pounds air pressure at the inlet valve is recommended. The net weight of model LA is 6,500 pounds; gross weight, 8,000 pounds. Packed for export, the machine occupies one box, 8-ft., 8-in., long, 5-ft. 5-in., wide, 5-ft., 1-in. high, containing 240 cu. ft.

The Miller Glass Feeder

The Miller Feeder, controlled by the Miller Glass Engineering Company, Swissvale, Pa., operates on the principle of running the glass at the regular working temperature, employing a large flow orifice, permitting the glass to flow in a large stream and as the stream starts to lengthen and get thin from the weight of the protruding gob, to accelerate the flow with the descending plunger to maintain its diameter, then suddenly stopping the downward travel of the plunger and reversing its motion, causing the neck of the gather to become thinner and permitting the shearing of it without forming a serious shear mark; also lifting the protruding stub off the shear blades, at the same time sealing the orifice and admitting a measured puff of air to hold the glass off the shear blades and the stub retracted within the hot orifice. This burns out the small shear scar and also causes a pause between gobs and controls the weight of the succeeding gob.

The cavity formed in the orifice by the blowback is somewhat similar to that formed by the blowback in a narrow mouth machine except that in the average practical operation of the feeder the cavity does not extend inwardly over two inches.



THE MILLER GLASS FEEDER

The size of the cavity formed by the blowback puff of air determines the duration of the pause between gathers and also the weight of the succeeding gob. The blowback puff volume is measured by filling an adjustable reservoir with air, through a reliable reducing valve. After the shears are completely closed and the orifice sealed, the supply of air to the measuring reservoir is shut off and the measured accumulated air is puffed under the orifice at a high initial pressure, which is proportionately reduced as the cavity is enlarged and offers less resistence.

As described by the manufacturer, the feeder plunger which forces out the glass and retracts the depending stub away from the shears, operates on the same principle as the manually manipulated punty, which forms and drops the gob into the mold, then necks it to facilitate shearing, then retracts the depending stub away from the shears. Then the stub must be returned into the furnace heat to remelt it and prevent further chilling during the pause between gathers.

The air puff returns and holds the depending stub back into the furnace heat to remelt it and create a pause between gather, during which the charged mold is moved to forming position and an empty mold shifted into position to be charged.

By simply turning the adjustment screw of the air-reducing valve to the right or left to increase or reduce the blowback air pressure, the weight of the gob is decreased or increased. Every pound of air increase or decrease makes approximately one ounce difference in the weight of the gob.

Canadian Marking Regulations Modified

Important relaxations of the proposed Canadian regulations regarding marking of imported goods with country of origin were announced by the Canadian authorities on December 19, 1921, according to a telegraphic report received at the Department of Commerce from Consul General John G. Foster, at Ottawa.

Most American manufacturers and exporters to Canada will now be able to meet the requirements of the Canadian law without any material change from the usual marking of their goods for domestic trade As originally issued, the Canadian regulations insisted that "Made in U. S. A." or a closely similar mark, appear on all imported goods capable of being marked, and otherwise on the containers, wrapper, or tag. According to the revised regulations, section 13, which prescribes the form of marking, is modified so as to permit "the name of a manufacturer or his trade-mark accompanied by the name of the country or a place in a Province, State, or other division of a country where the goods have been manufactured or produced" to be accepted as sufficient indication of the country of origin. Sections 12 and 19, which specified the form of marking more minutely, are canceled, as apparently unnecessary under the broader relaxation.

Second in importance only to the general relaxation as to the form of marking is the new provision regarding articles not themselves capable of being marked without injury, and which were required to be marked on the band, wrapper, or other container. As now modified, no indication of origin will be required if such articles are of a class or kind not made or produced in Canada.

Section 18, which covered the marking of goods in the crude state, partially manufactured materials, and also parts, in most cases formerly allowed exemption from marking only when at least 25 per cent of the total cost of production of the article going into consumption in Canada was incurred in that country, has also been relaxed, and now reads as follows:

The following goods will not be required to be marked with the indication of country of origin, viz: Goods in a crude, raw, or rough state, or goods which are not intended for sale to the consumer in the condition imported but which are merely for use in the manufacture, construction, or repair of articles in Canada.

The general marking law went into effect o nJanuary 1, 1922. and it is a significant indication of the liberal attitude of the Canadian authorities that the final regulations contain this instruction to the customs officials:

Collectors and other officers concerned are instructed to exercise reasonable discretion in the enforcement of the Regulations Governing the Marking of Imported Goods with an Indication of the Country of Origin, so as not to impose undue restrictions on importers and thereby cause unnecessary inconvenience and irritation.

[The official text of the modifications granted in the Canadian market regulations is printed in *Commerce Reports* of January 2, 1922.]

Second-Period Blast of 1921-1922

The delay which appeared to be threatened in the resumption of work by the hand-blown window glass factories scheduled to operate during the second-period blast of the 1921-1922 season having been averted by a compromise settlement, under which the National Window Glass Workers Association, at a conference held at the Hotel Statler, Cleveland, O., on January 28, signed an agreement with the National Window Glass Manufacturers, accepting a 30 per cent wage reduction for window glass workers in all parts of the country, it is now probable that operations will be resumed at once in the following factories.

		Pots
Allegheny Window Glass Co.	Port Allegheny, Pa.	24
Big Horn Glass Co.	Lovell, Wyo.	36
Clarksburg Window Glass Co.	Clarksburg, W. Va.	36
Connelly Glass Co.	Caney, Kan.	36
Crescent Window Glass Co.	Weston, W. Va.	24
Crown Window Glass Co.	Maumee, Ohio	30
Dunkirk Window Glass Co.	S. Charleston, W. Va.	36
Eldred Window Glass Co.	Punxsutawney, Pa.	42
Empire Window Glass Co., No. 1.	Shinglehouse, Pa.	30
Erie Window Glass Co.	Sandusky, Ohio	30
Fairmont Window Glass Corp'n.	Fairmont, W. Va.	30
Harding Glass Co., No. 1.	Fort Smith, Ark.	48
Hermosa Glass Co.	Hermosa Beach, Cal.	36
Houze Window Glass Co.	Point Marion, Pa.	24
Ideal Window Glass Co.	West Union, W. Va.	24
Indiana Window Glass Co.	Vincennes, Ind.	30
Jeannette Window Glass Co.	Point Marion, Pa.	30
Liberty Window Glass Co.	Clarksburg, W. Va.	36
Licking Window Glass Co.	Utica, Ohio	42
Marion Window Glass Co.	Mannington, W. Va.	42
Masontown Window Glass Co.	Masontown, Pa.	42
Model Window Glass Co.	Fort Smith, Ark.	24
Modern Window Glass Co.	Salem, W. Va.	36
National Sash & Door Co.	Independence, Kans.	48
National Glass Co.	Shreveport, La.	42
Norwood Glass Co.	Clarksburg, W. Va.	42
Paramount Window Glass Co.	Salem, W. Va.	30
Pioneer Window Glass Co.	Marietta, Ohio	36
Premier Window Glass Co.	Pennsboro, W. Va.	42
J. J. Quertinmont Glass Co.	Point Marion, Pa.	24
Royal Glass Company, No. 1.	Grafton, W. Va.	30
J. B. Scohy Glass Co.	Sistersville, W. Va.	24
Superior Glass Products Co.	Huntington, W. Va.	24
Victory Window Glass Co.	Augusta, Kans.	33
		1,143

The plants of the Belmont Window Glass Company, Barnesville, Ohio; Brownsville Window Glass Manufacturing Company, Brownsville, Pa.; Johnston Window Glass Company, Hartford City, Ind., and Quertinmont Glass Company, Fairchance, Pa., originally scheduled for resumption of operations in the second period, in all probability will be inactive.

New Export Classification for Glass

The statistical division of the Bureau of Foreign and Domestic Commerce, on January 1, 1922, adopted a new classification for export figures for glass and glassware.

The new classification comprises: Plate and window glass—common window glass, plate glass (unsilvered), wire glass, other window and plate glass; glass containers (bottles, vials, and jars); plain table glassware; table and other glassware cut or engraved; glassware for lighting—lamp chimneys and lantern globes, globes and shades for lighting fixtures, lamps and other illuminating devices chiefly of glass; chemical glassware; electrical glassware except for lighting; and other glassware not elsewhere specified. Quantities as well as values will be given.

A. B. Houghton, Ambassador to Germany

The appointment of ALANSON B. HOUGHTON of the Corning Glass Works, Corning, N. Y., to be United States Ambassador to Germany was announced from the White House on January 17, and his nomination was sent to the Senate for confirmation.

ALANSON B. HOUGHTON

Mr. Houghton is a member of the House of Representatives for the 37th New York District.

The glass trade is honored by the selection of one of its distinguished representatives for the exceedingly important post to which Mr. Houghton has been assigned.

Mr. Houghton was born October 10, 1863 in Cambridge, Mass.; went to Corning with his people in 1868, was educated at St. Paul's School, Concord, and Harvard University, graduating from the latter in 1886; he spent the next three years studying in Germany and France, then entered the employ of the Corning Glass Works in 1890; becoming second vice-president in 1898 and president in 1910, which position he resigned on being elected to Congress in 1918. Since that time he has been chairman of the Board and member of the Executive Committee. He is a director of the Metropolitan Life Association, a vice-president of the Ephriam Creek Coal and Coke Company and is connected with various smaller companies of one sort and another. On entering Congress he was placed on the Committee of Foreign Affairs where he served for his first term. At the beginning of his second term he was placed on the Committee of Ways and Means where he has remained until now.

Bottle and Glassware Production

Figures compiled by the Department of Commerce, through trade associations show that bottle production in October and November, 1921 was 70 and 86 per cent, respectively of the average monthly production of 1919. November, 1921 showed a decrease of 30 per cent from November, 1920 production.

Net orders received for illuminating glassware increased during the Fall months of 1921 as follows: August over July, 42.9 per cent; September over August, 31.4 per cent; October over September, 44.6 per cent; November over October, 3 per cent. Production of illuminating glassware in November, 1921, was 51.7 per cent of capacity. From July to August, 1921, production decreased 4.2 per cent, then increased month by month, as follows: August to September, 54.3 per cent; September to October, 62 per cent; October to November, 40.9 per cent. Shipments billed in August, 1921, were 32.6 per cent less than in July. Billings increased in September 37.1 per cent over August, in October, 55.3 per cent over September, and in November 20.5 per cent over October.

Pittsburgh Glass Exhibit Closes

The annual Glass and Pottery Exhibit at Pittsburgh closed with exhibitors fairly well satisfied with the outcome of their efforts, orders totaling a large amount having been taken during the three weeks period covered by the exhibition. A number of manufacturers transferred their exhibits to Chicago, which city is making a special effort this year to entice away from other sections as large a number of the buyers as possible. The Chicago exhibition will be held at the Hotel Morrison from February 6th to 18th, inclusive.

A New Building Record

The upward trend in building construction was unexpectedly accelerated in the twenty-seven northeastern states as shown by the Dodge Reports for December, which record a gain of 3 per cent over November, 1921, an abnormal condition, as December usually shows a decline from November. The contracts placed totaled $198,518,000, which is 98 per cent over the December, 1920, figures, and the largest amount, with the exception of that of December, 1919, ever closed during the last month of the year. The total amount of contracts let during 1921 was $2,359,018,000, only 8 per cent under the 1920 total.

Recent Death

G. W. KLAGES, manufacturer of special glass cutting machinery, window glass cutting tables and tools, of Pittsburgh, Pa., died on January 28, after a long illness.

Inquiries Received

For further particulars address THE GLASS INDUSTRY.

52—Do you know of any one who manufactures an electrically-heated silvering table for mirror factories?

53—Who makes Resisto, a material used in the process of stencilling glassware?

54—We would like to have the address of any firm making apparatus for spraying molten metal on to various objects.

55—Kindly furnish us with the names of glass concerns manufacturing bottles similar to beer bottles.

56—(From Japan) Kindly put us in touch with glass sand plants on the Pacific coast which are in a position to supply us with the best crystal sand.

Coming Meetings and Other Events

AMERICAN CERAMIC SOCIETY.—Twenty-first annual meeting at St. Louis, Mo., Februray 27 to March 3, 1922.

CHICAGO EXHIBIT of glass, pottery, lamps and house furnishings, Hotel Morrison, Chicago, Ill., February 6 to 12, 1922. A large number of glass factories will exhibit their goods.

The annual exhibition of the ARCHITECTURAL LEAGUE OF NEW YORK takes place this year in the Fine Arts Building at 215 West 57th street. There will be a public exhibition commencing on Sunday, February 5, and lasting until March 4, inclusive, which will include drawings and models of proposed and executed work, both in architecture and the allied arts; also, specimens of decorative painting, furniture, metal work and ceramics.

News of the Trade

THE GLASS INDUSTRY will be glad to receive notices of new glass manufacturing projects, plant extensions, removals, personal items, etc.

The DURAND-WILCOX GLASS COMPANY, Newfield, N. J., has been organized with a capital of $100,000 by Victor Durand, Marie D. Durand, of Vineland, N. J., and Albert C. Wilcox, Bridgeport, Conn.

The BULLET-PROOF AND NON-SHATTERABLE GLASS CORPORATION, according to reports, has leased a factory at Elizabeth, N. J., and operations will be started as soon as the necessary machinery has been installed.

The glass plant at Salem, Va., has been bought in from the trustees in bankruptcy by Col. James P. Woods and B. P. Shelor. The works have been closed for some time, and no definite arrangements have been made as yet for resuming operations.

According to a press report the CENTRAL GLASS CASKET COMPANY has been incorporated at Detroit, Mich., with a capital of $1,500,000. The report also states that the new concern has purchased the plant of the De Camp Glass Casket Company of Chattanooga, Tenn.

The office of the National Window Glass Workers has been moved from 419 Electric Building to 1103 Ulmer Building, Cleveland, Ohio. John M. Siemer has been appointed editor of the association's publication, the *National*, to take the place of Joseph M. Neenan, who recently resigned.

Reports are current that hand window glass factories in Salem, West Union and Pennsboro, W. Va., with a combined capital of about $1,000,000 are considering the advisibility of merging with Clarksburg, W. Va., glass factories with the object of strengthening their position, particularly with regard to wage and gas problems.

It is reported that the CREAM CITY MIRROR PLATE COMPANY, Milwaukee, Wis., has been incorporated with a capital of $50,000 to manufacture mirrors, glass products, etc. The incorporators of the new company, which succeeds the company of the same name which was recently dissolved, are: H. R. Seidel, Edward H. Smith and William Mauthe.

J. D. Biggers, vice-president and assistant general manager, THE OWENS BOTTLE COMPANY, Toledo, Ohio, states that the report that his company has acquired a factory site at Monroe, La., is incorrect. The Owens company has been considering the desirability of having a plant in the south, but has not determined upon a location.

J. W. Hobbs, managing director of the CANADIAN LIBBEY-OWENS SHEET GLASS COMPANY, LTD., reports that the Hamilton plant started operations with tank No. 1 some weeks ago and that tank No. 2 is lighted and the second Libbey-Owens machine will be in operation the early part of February. Mr. Hobbs also states that the demand for the product of the new plant has been good and that a successful run is anticipated.

C. I. Hall, sales engineer, of the AUTOMATIC MACHINERY COMPANY, manufacturers of conveyors and automatic lehr feeders, Terre Haute, Ind., is soon to leave for South America where he will install equipment recently sold to Cristalerias Rigolleau, Buenos Aires. Mr. Hall will also call on the various glass factories in the South American countries, in the interest of the company.

HOWARD B. BISHOP, 101 Park avenue, New York, chemical engineer and formerly connected with the General Chemical Company and the National Aniline & Chemical Company, has purchased from the executors of the estate of John C. Wiarda, the assets of their chemical and jobbing business at 273 Green street, Brooklyn, N. Y., and will continue the business under the name of JOHN C. WIARDA & COMPANY, INC.

The seventy-seventh Annual Sales Conference of the staff of the LACLEDE-CHRISTY CLAY PRODUCTS COMPANY of St. Louis, Mo., was held at their general offices in that city on January 4th to 6th inclusive. Plans were outlined for the campaign of 1922. Addresses were delivered by J. L. Green, president of the company, and by H. G. Kenagy, Carnegie Institute, Pittsburgh, Pa., and others. An illustrated lecture on the glass industry was given by Mr. Crawford.

According to the Fargo (N. D.) *Courier-News* the FARGO GLASS COMPANY, Fargo, N. D., is planning the erection of a $60,000 building and has already made application to the secretary of state to increase its capital from $50,000 to $100,000. The following officers of the company were named at the recent annual meeting: E. K. Schonberg, president and general manager; J. J. Larkin, vice-president, R. J. Cone, secretary-treasurer; J. N. Jenson, member of executive committee, and A. Hartley, manager of construction department.

United States Trade Commissioner George S. Brady reports that a new glass-bottle factory is being installed in the city of Mendoza, the center of the wine industry of Argentina. The factory when completed will have a capacity of 15,000 wine bottles daily. The sand available locally is said to be of excellent quality for glass making. Oil from the field of the province of Mendoza will be used as fuel. Local capital is financing the enterprise, which will provide locally a supply of bottles for the wine industry, heretofore dependent upon the factories of Buenos Aires, 650 miles away.

Glass Casket Companies' Names Confused

Roy M. Nolan of the Glass Casket Corporation, Altoona, Pa., desires to call attention to the fact that the company at Altoona with which he is associated is entirely distinct and separate from the Ada, Oklahoma, plant mentioned in the second paragraph on page 277 of the November, 1921, issue of THE GLASS INDUSTRY. The Ada plant was mentioned only incidentally in the article referred to, which is mainly a description of equipment installed at the Altoona plant. Mr. Nolan states that the Ada plant is operated by entirely different interests.

Monthly Summary of Imports and Exports

Exports of all kinds of glass and glassware in December, 1921, as shown by the Monthly Summary of Foreign Commerce, totaled in value $878,768, equal to about 29% of the exports in December, 1920, which were $3,051,540. For the twelve months ending December, 1921, exports totaled $14,437,162, compared with $30,086,211 and $24,796,661 for the corresponding periods in 1920 and 1919, respectively.

Imports in December, 1921, were $796,899, compared with $918,883 in December, 1920. For the twelve months ending December, 1921, imports totaled $10,691,505, while for the corresponding periods in 1920 and 1919 they amounted, respectively, to $8,500,126 and $2,061,580.

Foreign Trade Opportunities

Further particulars may be obtained from the Bureau of Foreign and Domestic Commerce, Washington, D. C.

598.—The purchase is desired by a mercantile firm in Canada of cut glass, stem ware, in large quantities. Quotations should be given f. o. b. point of shipment. Cash to be paid. References.

602.—An inquiry has been received from a firm in Mexico for the purchase of 2 carloads of pint beer-malt bottles of light and dark color. Quotations should be given f. o. b. El Paso, Tex. References.

626.—A commercial agency on commission is desired by a firm in India for the sale of glassware, etc. Quotations should be given c. i. f. Karachi or Bombay. Payment to be arranged through banks by confirmed letter of credit. References.

644.—The purchase is desired by a firm in Canada of cut glass. Quotations should be given f. o. b. Canada. Cash to be paid. Shipment to be made all rail. Reference.

647.—Because of considerable building operations now being undertaken in Japan there is an increased demand for window and plate glass. A request has been received for quotations c. i. f. Keelung or f. o. b. Pacific ports. Reference.

663.—An electric supply house in Canada desires to purchase glass shades with fringe for electric lamps and boudoir table lamps. Quotations should be given f. o. b. Canadian destination. Cash to be paid. References.

Business Publications

QUIGLEY FUEL SYSTEMS. Bulletin No. 12. Hardinge Company, New York. Treats in a thorough manner the subject of powdered fuels with special emphasis on the methods employed to properly prepare and burn the powdered coal. Illustrated with views of installations in plants operating boilers and metallurgical and other furnaces, dryers, kilns, etc.

HYTEMPITE IN THE POWER PLANT.—Quigley Furnace Specialties Company, Inc., New York, N. Y. A 22-page bulletin describing the many uses to which Hytempite, the well-known plastic refractory material, has been successfully applied in thousands of plants. Instructions are given for laying-up fire brick masonry to secure a perfect bond, for patching and repairing boiler settings, for lining furnace doors, repairing tiles, constructing baffles, protecting blow-off pipes, hot patching, and so forth. Hytempite can also be used successfully around lehrs and glass melting furnaces in all places except where molten glass might come in contact with it.

LINK-BELT STEEL CHAINS for power transmission, elevating and conveying. Book No. 475, Link-Belt Company, Chicago, Ill. A 76-page catalog of the Company's various types of chains, sprocket wheels, and other parts and fittings that enter into "Link-Belt" conveying, elevating and power transmission machinery. Dimensions, weights and other data are tabulated.

Current Prices of Glass-Making Materials

From quotations furnished by various manufacturers and dealers

January 30, 1922

		Carlots	Less Carlots
Alumina hydrate	lb.	.05½	.06
Alumina oxide	lb.	..	..
Antimony oxide	lb.	..	..
Arsenic trioxide (dense white, 99%)	lb.	.07–.07½	
Barium carbonate	ton	50.00	65.00
Barium hydrate	lb.	..	..
Bone ash	lb.	.05½	.06½
Borax	lb.	.05¼–.05½	.05½–.06
Borax, fused, any mesh	lb.	.19	.20
Boric acid, fused	lb.	.35	.35
Cadmium Sulphide, red or orange	lb.		1.50
Cadmium Sulphide, yellow	lb.		1.50
Cobalt oxide ....in bbls. per lb.			2.00
Cobalt oxide ....in 10 lb. tins,	lb.		2.10
Copper oxide, red	lb.		.17 –.20
Copper oxide, black	lb.	.23	.26
Copper oxide, black, prep'ed,	lb.		.30
Cryolite	lb.		.10
Feldspar, 100 mesh	ton	15.00	
Fluorspar, powdered white, 95%	ton	35.00	
90%	ton	33.00	38.00
Kaolin	ton	17.00	25.00
Lead oxide (red lead, Pb_3O_4)	lb.	.08	.08¼
Litharge (PbO)	lb.	.07½	.07¾
Lime—			
Hydrated (in 50 lb. paper sacks)	ton	10.50	
Burnt, ground, in bulk	ton	6.75	
Burnt, ground, in paper sacks	ton	8.75	
Burnt, ground, in 280 lb. bbls. per bbl.			
Manganese (85% MnO_2)	lb.	.04½	.05 –.06½
Nickelic Oxide (NiO) black	lb.	.45	.50
Nickelous Oxide (Ni_2O) green	lb.	.50	.55
Potassium carbonate—			
Calcined 90%	lb.	.06	.07
Hydrated 90%	lb.	.06½	.08
Potassium nitrate	lb.	.07½	.08
Powdered blue	lb.		.24 –.26
Powdered blue (std. formula)	lb.		.38
Salt cake, glassmakers, f. o. b. works	ton	21.00	.01½–.02 lb.
Selenium	lb.		1.95–2.25
Soda ash, 58% dense, 48% basis			
Bulk	100 lb.	1.40	1.50
Bulk, on contract	100 lb.	1.35	
Sodium nitrate, refined	lb.	.04½	.05
Sodium selenite	lb.		2.25–3.05
Sulphur (flowers)	lb.	.02¼	.02¾–.03
Sulphur (flour, heavy)	lb.	.02	.02½
Uranium Oxide—100 lb lots	lb.	2.10	2.25
Zinc oxide (ZnO)	lb.	.08	.09–.11

Stock Quotations

(Reported by Moore, Leonard & Lynch, Frick Building, Pittsburgh, Pa.

Pittsburgh Stock Exchange—January 28, 1922

	Bid	Asked	Last
American Window Glass Machine common	68	70	69
American Window Glass Machine pfd	86	88	87
American Window Glass pfd	96	101	98
Pittsburgh Plate Glass	130	133	131½
U. S. Glass	40	45	41

The stocks of Pittsburgh glass companies have been strong and active the past month. All of the companies above mentioned paid the regular dividends this month, with the exception of Pittsburgh Plate Glass, which dividend is not due until April. Reports of the companies are much more encouraging. The newspapers report a new wage agreement.

Wheeling Stock Exchange—January 28, 1922

	Bid	Asked	Last
Hazel-Atlas Glass	143	145	145
Fostoria Glass	115	...	115
Central Glass	100	125	125
Imperial Glass	95	100	100

Glass shares of the Wheeling Stock Exchange have been strong the past month, with the exception of Central. This company passed its regular dividend, owing to large expenses incident to the subterranean fire beneath its plant. Hazel-Atlas has increased its dividend to 2% quarterly in contrast to 1% paid the past two quarters. There are signs of rapid improvements in the local glass trade.

Toledo Stock Exchange—January 28, 1922

	Bid	Asked	Last
Owens Bottle Machine common	25¾	26¼	26
Owens Bottle Machine pfd	95	97	97
Libbey-Owens Sheet Glass common	90	94	94
Libbey-Owens Sheet Glass pfd	95	100	97

Market strong, but dull.